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Report of the Chief of the Forest Service, 1965

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United States Department of Agriculture

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U.S. Department of Agriculture,
Forest Service,
Washington, D.C., January 1, 1966

Hon. Orville L. Freeman,
Secretary of Agriculture.

Dear Mr. Secretary:

I am pleased to send you this report on Forest Service programs and activities during 1965. Nationwide, the forestry situation was generally good. However, there is still room for much improvement in the smaller farm and other private woodlands. A program has been prepared to accelerate forestry practices on these private ownerships.

As a general theme, we stressed not only the economic value and use of forests, but their capacity to serve people, and enhance the beauty of the countryside. We cooperated fully in the President's and Mrs. Johnson's drive to clean up and beautify America.

National Forests provided more services and more products to more people last year. A number of records were set—in timber sales and harvests, greater public recreation use, reduced fire damage, and increased cash receipts.

Forestry research made many solid contributions to an improving forestry technology. Notable were accomplishments in solving wood utilization, forest products marketing, and resource management problems in rural America.

We began an internal reorganization placing greater emphasis on State and Private Cooperative Forestry—with the intent of stepping up aid and guidance to the private woodland owner. Our activities made outstanding contributions to the economic strength of rural communities in many areas.

Overall, it was a year of constructive activity—a year of progress in forestry and natural resource programs in which all conservationists may take pride.

Sincerely yours,

Edward P. Cliff

Edward P. Cliff,
Chief, Forest Service.

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This report covers calendar year activities unless otherwise identified. Records on a fiscal year basis are so reported. Mention of commercial companies, products, or services is solely for necessary historical identification and implies no endorsement.

The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

Issued March 1966

Report of the Chief of the Forest Service, 1965

Introduction—Highlights

This was the year in which a significant dimension was added to resource conservation—that of natural beauty. Early in the year a stirring challenge was issued by President Johnson in his Message to Congress on Natural Beauty. He called for a new, "creative conservation of restoration and innovation" that would counteract "the threat of eventual blight to our God-given heritage of natural beauty."

The White House Conference on Natural Beauty followed in May and gave great impetus to the concept of cleaning up and beautifying the American countryside.

We of the Forest Service believe this to be a great challenge to forestry and natural resource conservation. We have accepted the challenge wholeheartedly and have moved all along the line to help create a more beautiful America while building up and using its natural resources to the fullest.

There is a close kinship between forestry and natural beauty. One who has known National Forests, or even visited them, could not be unaware of the great variety and sweep of their beauty, at once dramatic and inspiring. Thus the idea of achieving both beauty and use in connection with forests has been with us a long time.

But there is a difference now. Tying the term "beauty" to an outdoor cleanup campaign has caught the public's fancy. The difference is that never before has such a campaign been led and carried forward at the highest levels of government, beginning with President and Mrs. Johnson, and including a mobilized effort by all Federal, State, and local agencies.

In such an atmosphere, professional resource managers and conservationists must exert every effort to make this drive a success. For herein we have the opportunity to make every American a conservationist. The result may be that our forests and other natural resources will flourish in the highest service to the people, and our country will grow in greatness as it becomes more attractive.

As this new wave of conservation began this year, we were emphasizing *beauty* and *use* in the three major areas of Forest Service activity: National Forest Management, Forestry Research, and Cooperative State and Private Forestry Programs. Following are some of the year's highlights.

The American Outdoors—Management for Beauty and Use.—This is the name of a 76-page illustrated booklet published during the year, outlining ways to beautify the American landscape and at the same time make good use of the land.

The booklet is based on several decades of Forest Service research and experience in land management. It was designed to assist land planners and managers in carrying out their local programs, and to make interested citizens aware of the opportunities for promoting natural beauty.

Another important publication of the year was *Outdoor Recreation in the National Forests.* Called a "state-of-the-forests" message on this fastest growing use of the National Forests, the booklet is an overall appraisal of the resources available for public enjoyment, a summary of management programs, and a projection of future recreation use of these public forests.

A book of both practical and scientific importance was published by the Forest Service during the year; this was the 750-page Agriculture Handbook No. 271, *Silvics of Forest Trees of the United States.* This book, over a decade in preparation, should be an important reference for forest managers, scientists, and students. It defines the distribution and silvical characteristics of 125 important forest tree species and cites literature related to each one.

The 60th Anniversary.—On February 1, 1965, the Forest Service observed its 60th birthday. On the same day in 1905, Congress transferred the then Forest Reserves from the Department of the Interior to the Department of Agriculture. The present Forest Service dates from that act. In 1905 there were 60 Forest Reserves with a total of about 56 million acres. Today there are 154 National Forests and 19 National Grasslands covering 186 million acres.

Cash receipts from the National Forests that first year came to $73,183. This year, receipts reached nearly $150 million. In 1958 we marked the billionth dollar of National Forest income; now we are nearing the second billion in this increasing flow. And cash dividends are only a small part of the values and benefits that the

American people receive from their National Forests.

Cash Receipts Up $10 Million.—The record receipts from the 154 National Forests came to $147,410,834 for fiscal year 1965—an increase of $10 million over last year's amount. The major portion of this—about 90 percent—came from the sale of National Forest timber. The remainder was from grazing fees, power rights, mineral leases, recreation fees, and other land-use permits.

One-fourth of the receipts are turned over to the States to be used for public roads and schools in counties where National Forests are located. This amounted to $35.5 million in fiscal year 1965. Oregon received the largest share, $15,614,000, and North Dakota the smallest, $65. These figures do not include payments from National Grasslands receipts, which are computed on a calendar-year basis.

Another Record Timber Harvest.—More timber was harvested from the National Forests in fiscal year 1965 than ever before. A record 11.2 billion board feet was cut, compared with 10.9 billion in 1964. This 1965 harvest represents about one-fourth of all the timber cut in the country. It would build 1¼ million homes, enough to house the population of metropolitan Philadelphia.

It generated over $4 billion in the Nation's economy. For each $1 worth of timber stumpage, an estimated $25 worth of business (in wages, transportation, manufacturing, wholesaling, and retailing) is created by the time the timber is used for housing or other purposes.

Under multiple use and sustained yield management, this vast supply of timber—and even greater cuts—can be harvested from National Forests year after year, forever.

Recreation Use Still Climbing.—National Forests continued to draw record numbers of American people for outdoor recreation. For 1965, an estimated 150 million visitor-days of use were chalked up. (Final figures will be available later in a supplement.) This was an increase of about 16 million visitor-days over 1964—about the same 11 to 12 percent annual rise that has occurred for the past decade. Recreation use in 1965 would be roughly equivalent to three out of four of the American people (men, women, and children) spending 1 day on a National Forest.

Smokejumpers Mark 25th Anniversary.—Since they made their first firefighting leap 25 years ago, the now-famous Forest Service smokejumpers have jumped more than 60,000 times without a fatal accident. That is the equivalent of four full airborne divisions jumping without a fatality—a safety record in which the Forest Service takes great pride. And the men who made the jumps and those who trained them and managed the program are due the highest prise.

The first jumps were made July 12, 1940, by Earl Cooley and Rufus Robinson. Mr. Cooley is now a parachute project superintendent at Missoula, Mont. Similarly, a veteran of the first experimental jumps in 1939, Rufus Robinson, is still active as foreman of the Okanogan Aerial Project in Washington State.

Smokejumping proved its value quickly as the fastest and most economical way to reach remote forest fires and stamp them out while still small. Today it is standard procedure in the heavily timbered and mountainous West. Military units have also drawn heavily on smokejumping experience in shaping programs for paratroops and air-rescue operations. In 1965 the smokejumpers made 963 jumps to more than 300 fires, adding to the record of millions of dollars' worth of natural resources saved from destruction in this way.

The Job Corps Program on National Forests became fully operational during 1965. Forty-five Job Corps Conservation Centers in 29 States were activated with a total corpsmen capacity of 7,442. Construction was nearly complete at the two other approved centers.

Both human and natural resources are being upgraded through these Conservation Centers, as young men improve their education and job skills in preparation for a more productive life. The Forest Service sees great potential in the centers, and takes pride in being a part of the undertaking, shared jointly with the Office of Economic Opportunity.

Federal Recreation Sticker on Sale.—A new $7 Federal Recreation sticker went on sale, as authorized by the Land and Water Conservation Fund Act of 1965 (L&WCF). The sticker, good for 1 year, admits the holder and occupants of his car to all Federal recreation areas where there is investment in improved facilities. Entrance fees had been charged at some areas before, and many areas remain available for public use without charge. But the number of areas requiring entrance fees was greatly expanded under the new law. Day-use fees or seasonal permits are available in lieu of stickers in many cases.

About 2,000 areas on National Forests were designated to charge entrance fees. From May to October 1965 the Forest Service collected approximately $1 million in fees and from sales of the sticker.

Proceeds from the sticker and entrance fees go into the Land and Water Conservation Fund which is administered by the Bureau of Outdoor Recreation. Money in the fund is then appropriated to buy land having recreational value, or otherwise to provide more public recreation opportunities on State and Federal lands.

First Land Acquired Under New Law.—The other phase of the Land and Water Conservation Fund Act—the acquisition of recreation land—was already in operation. The first purchase of land was made October 19, 1965. It is a beautiful, 319-acre stretch of wooded country along the historic Shenandoah River about 12 miles southwest of Front Royal, Va. Located inside the boundaries of the George Washington National Forest, the

tract is within an hour's driving time of the Washington, D.C., metropolitan area. Plans are being made to develop the area appropriately for public recreation use.

First National Forest "National Recreation Area."—The first National Recreation Area within a National Forest was established September 29, 1965, when President Johnson signed Public Law 89–207. This created the Spruce Knob-Seneca Rocks National Recreation Area as a part of the Monongahela National Forest. The 100,000-acre area near Franklin, W. Va., is unique in scenic and recreation values, including Spruce Knob, the highest mountain in the State. We plan to develop facilities to accommodate a million visits a year by 1970.

Nearly half the area is already National Forest land. A small portion of the total area now in private hands will be purchased with funds appropriated under the Land and Water Conservation Fund Act. Scenic or conservation easements will be secured for most of the remaining privately owned land.

The area will be managed under basic Forest Service principles of multiple use and sustained yield, permitting timber cutting, grazing, and mineral development, modified as needed to safeguard recreation values. But outdoor recreation and conservation of scenic, scientific, and historic values are recognized as the primary resource.

TV Conservation Message Reaching Millions.—Each Sunday night at 7 p.m. 40 million people, according to the ratings, watch the popular Lassie—Forest Ranger show on the CBS–TV network. Filmed in color on the National Forests, the series has educational value in telling the American people more about forestry and natural resource conservation.

The show is now in its second year, featuring Forest Ranger Corey Stuart (Robert Bray) as co-star with the famous collie. In recognition of the public service aspects, Secretary of Agriculture Orville Freeman in May presented the program a special award for "outstanding work in the conservation cause."

In October 1965, the professional ratings placed the Lassie—Forest Ranger show among the top 10 on TV, holding an impressive 40 percent of the viewing audience in its time segment.

Forest Fires Kept to Record Low.—In 1965 the acreage burned within the National Forest protection area was the lowest in Forest Service history. This despite the fact that use of the forest continues to increase, with more timber being cut, more recreation visitors, and step-ups in other uses—all bringing more people into the forest and thus increasing the possibility of fire. During the year, 9,337 fires burned only 76,585 acres, with an average of just over 8 acres per fire. In the previous year, 9,749 fires burned 183,154 acres.

The National Forest protection area includes the 186-million-acre National Forest System, plus privately owned lands inside the boundaries and some additional private lands adjacent to the boundaries.

Nation's Timber Situation Improved.—American forests have made a comeback during the past quarter century and timber growth now exceeds the cut, but the supply of large trees and quality timber is declining. These are highlights of *Timber Trends in the United States*, published in March 1965. It is the result of one of the periodic studies the Forest Service makes to appraise the overall timber situation of the country. The last one, released in 1955, was based on statistics gathered in 1952. A considerably improved timber outlook is shown by the 1965 report.

The increased growth—overall about 60 percent more timber is being grown than cut—marks a noteworthy success. It shows that our forest resources are in a better condition to serve the people by helping to build a more prosperous and attractive America.

Progress in fire control, tree planting, and research all lead to increased growth and better utilization. But the demand for timber and other forest resources, such as outdoor recreation, will continue to rise as the population grows. Thus we still need to intensify forestry practices—to improve the supply of larger trees of the more valuable species, to take care of long-run needs after 1990, to meet expanding demands for timber, as well as to provide for outdoor recreation, water supplies, and other forest resources which a larger population is certain to need.

Nuclear Gage Gives Better Snow Measurement.—A new system of snow measurement using a nuclear gage will permit accurate measurement of changes in the snowpack and lead to better forecasts of streamflow. It was adapted and tested by Forest Service scientists cooperating with the Atomic Energy Commission. The new gage could replace the Mt. Rose snow sampler—a tube driven into the snow by hand—developed 56 years ago.

For the first time, hydrologists can measure snow structure changes in place. The new system and related gages will revolutionize the study of snow hydrology and snow surveys which guide the management of flood-control and water-supply reservoirs throughout the West.

New Kind of Truck Tire Can Reduce Costs.—Efficiency and economy of operations were stressed throughout the Forest Service. One means of saving money appears to be in a new kind of truck tire. By use of wide single tires in place of duals on logging trucks, we see a large potential savings in road building and maintenance.

Under Firest Service direction, tests were made by the University of Washington and the Weyerhaeuser Co. Results indicate savings through less costly roadbeds and reduced road damage, a greater payload with better fuel mileage, reduced tire costs, less equipment maintenance, better riding qualities, and improved braking.

The single tire, utilized for years by aircraft and other off-highway hauling equipment, is already commercially available. Trucks equipped with dual tires can be converted without major alteration or design change.

Another Billion Trees Planted.—On all classes of land, more than a billion trees were planted or seeded on 1,232,000 acres in 1965. This is about the same rate of reforestation as in the last 5 years. About a million acres of this—or 80 percent—was on State and private lands, while the remainder was on National Forests and other Federal lands.

Planting and reseeding of 232,000 acres on the National Forests set an alltime record. Thousands of additional acres reseeded naturally on prepared sites. The previous record was in 1936 under the CCC program when 223,000 acres were planted or seeded.

Trees Detect Air Pollution.—Trees serve man in so many ways it is difficult to enumerate them. Now, with polluted air becoming more of a problem and gaining more attention, the eastern white pine may become a valuable indicator of toxicants in the atmosphere.

Our research has shown that certain pine foliar diseases are related to industrial and urban air pollution. So we have been developing genetic strains of eastern white pine that resist different airborne toxicants for use in high hazard areas. Certain strains of white pine are particularly susceptible to poisons in the air, and can be used as indicators. A calibrated series of susceptible trees planted in and about polluted areas can serve as long-term, economical, and highly efficient monitors of noxious materials. The eastern white pine has already shown its ability to detect extremely low concentrations of certain toxic substances, far below that registered by the best current instrumentation.

More Water From Municipal Watersheds.—Municipal water supplies could be increased sharply for some 400 cities in the Northeast by managing their forested watersheds primarily for water yields, Forest Service research shows. In the wake of serious drought in the Northeast, this information can be of tremendous importance.

The increase can be brought about by removing the trees from the drainageways and deep soil areas of the watersheds. Research on the Fernow Experimental Forest near Parsons, W. Va., showed that water yields could be increased by as much as 430,000 gallons per day from each square mile of upland forest that is clearcut. Cooperative watershed management research is now being carried out on Newark's Pequannock watershed and Baltimore's Liberty watershed.

New Help for Forestry Cooperatives.—Early this year, Secretary Freeman established a committee to encourage and aid forestry-based cooperatives. State Technical Action Panels (TAP's), composed of USDA specialists, are working with Regional Foresters to establish forestry cooperative advisory groups.

By the end of June, 20 State Technical Action Panels had appointed advisory groups to help local communities make studies and form forestry cooperatives. Workshops were held for State advisory groups, some of which have been very active. As a result, several sturdy forestry cooperatives probably will be in operation within another year. The purpose of these cooperatives, like others, is to enable a group of landowners to band together—for management and marketing purposes—and accomplish what they cannot do as individuals.

THE NATIONAL FOREST SYSTEM. The Forest Service is responsible for managing, developing, and protecting 186 million acres of land and its resources in the National Forest System. This includes 154 National Forests in 39 States and Puerto Rico, containing 182 million acres; 3.8 million acres of National Grasslands; and 160,000 acres of land utilization projects. Under multiple use and sustained yield, these lands are administered for their five basic resources: Outdoor recreation, range, timber, water, and wildlife.

National Forest Management and Protection

On July 25, 1965, Secretary of Agriculture Orville L. Freeman and Lynda Bird Johnson dedicated the Voyageur Visitor Center in the Superior National Forest in Minnesota. The ceremony followed a canoe trip made by the President's daughter through the Boundary Waters Canoe Area, one of the 54 National Forest wildernesses, now in the National Wilderness Preservation System, and managed by the Forest Service to conserve part of America's frontier heritage.

There are now six Visitor Centers in operation in the National Forests, all built within the last few years. Others are under construction or in the planning stage. The centers serve two purposes: (1) They make the many varieties of outdoor recreation on the National Forests more meaningful and enjoyable to visitors; and (2) they are part of the expanded and intensified effort of the Forest Service to show the American people the many benefits of forest conservation under a multiple use system of management.

Recreation is only one of the resources under management and protection on the 154 National Forests and 19 National Grasslands in 41 States. The others, including timber, water, wildlife, and forage, are managed according to the principles that have been traditional throughout the years and were legislatively recognized by the Multiple Use-Sustained Yield Act of 1960. Work plans and guides are drawn for Regions, individual National Forests, and Ranger Districts within these forests based on analyses of existing and potential resources as they relate to current and projected public needs. A pattern of coordinated resource uses is established for each zone of management prior to detailed day-to-day operations that are carried out according to plan.

TIMBER MANAGEMENT

Record Timber Harvest

For the third consecutive year, a record volume of timber was harvested from the National Forests. During fiscal year 1965, 11.2 billion board feet was cut—290 million board feet more than in the previous year. Receipts to the Treasury from this harvest amounted to $138.8 million, an increase of $10.8 million over the preceding year.

Timber Sales Up

The volume of timber sold on the National Forests during the fiscal year was 11.5 billion board feet—in 25,704 separate sales. (Timber is not necessarily cut in the same year in which it is sold.) Demand for timber remained strong, even though the volume sold in 1965 was somewhat less than the previous year. The tremendous damage to road systems and other improvements on the National Forests of northern California, western Oregon, and parts of Washington and Idaho as a result of floods on Christmas 1964 and in January 1965 impeded the flow of timber. More than 2.6 billion board feet of National Forest timber included in 458 timber sales was not available for cutting at the beginning of the normal operating season because of impaired road access. Numerous partially prepared or fully prepared sales had to be replaced with new sales in areas where flood effects were minor. In spite of these problems, an excellent record of accomplishment was achieved.

About $13 million was spent or obligated during the latter half of fiscal year 1965 to repair flood-damaged roads that provided access to timber sales. The damage was so severe, however, that more expenditures are necessary and completion of repairs is not expected before the end of fiscal year 1967.

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New Timber Sale Contract

The new timber sale contract, developed in close cooperation with industry representatives, was distributed to the field to be used for sales advertised after July 1, 1965. Programed training material was developed for training Forest Service personnel in the application of the new sale contract. The use of programed texts for this purpose will effect savings of nearly $480,000 in comparison with conventional training methods.

The Divisions of Timber Management and Budget and Finance collaborated in developing a new timber sale accounting system and conducted Service-wide training in its use. The new system is used with both the old and the newly revised timber sale contract. It not only establishes essential controls, but provides better records for both the purchaser and the Forest Service.

Five-Year Harvesting Record

Progress in harvesting the allowable annual cut under multiple use-sustained yield management for the past 5 fiscal years is shown in the following table.

Fiscal year	Annual [1] allowable cut	Actual volume cut	Percent of allowable cut harvested	Actual volume sold	Percent of allowable cut sold
	Billion bd. ft.	*Billion bd. ft.*	*Pct.*	*Billion bd. ft.*	*Pct.*
1961	10. 4	8. 4	81	8. 9	86
1962	10. 5	9. 0	86	10. 3	98
1963	11. 3	10. 0	88	12. 2	108
1964	12. 0	11. 0	92	11. 7	98
1965	12. 0	11. 2	93	11. 5	96

[1] As of January 1 preceding the fiscal year. Annual allowable cut includes only sawtimber for National Forests west of the Great Plains and in Alaska, and sawtimber and convertible products for National Forests in the eastern half of the United States.

Timber Inventories and Plans

Management plans for 19 working circles were revised and approved during the year. These plans covered 10,805,000 acres of commercial forest land. Two of the revisions were based on an improved inventory system which, without increasing costs, provides data necessary for better timber resource planning.

Record Reforestation

In fiscal year 1965, more acres of National Forest land were reforested by planting and seeding than in any previous year. This exceeds both the previous high of 221,193 acres reforested in continental United States during fiscal year 1963 and the long-standing record of 223,075 acres reforested in 1936 under the C.C.C. program on all National Forest land, including Puerto Rico. In addition, 26,072 acres were reforested by natural seed fall on land prepared by various cultivation methods to favor germination and growth of seedling trees. This work is done at less cost than planting or seeding but is effective only where conditions of site and natural seed fall are favorable.

The following table shows major reforestation and timber stand improvement work done in fiscal year 1965.

Type of work	Financed from—		Total
	Forest land management appropriation	Deposits by timber purchasers	
	Acres	*Acres*	*Acres*
Planted	[1] 97, 435	95, 398	192, 833
Seeded	22, 233	17, 676	39, 909
Natural regeneration on prepared sites	5, 075	20, 997	26, 072
Total reforestation	[1] 124, 743	134, 071	258, 814
Release	121, 684	183, 434	305, 118
Thinning	[1] 57, 719	64, 471	122, 190
Pruning	1, 658	5, 307	6, 965
Total T.S.I	[1] 181, 061	253, 212	434, 273

[1] Includes 49 acres planted and 10 acres thinned by enrollees at two Job Corps camps. This represents only the initial project work of the Job Corps, which was just getting started in fiscal year 1965.

Forest Service nurseries at 15 locations produced 103 million trees and 13 million more were grown at State nurseries for planting on National Forest land. The year's tree seed harvest totaled almost 50 tons of clean seed. Forest Service extractories processed 65,357 pounds from cones purchased largely from local people, and 33,067 pounds were purchased from tree seed companies. The tree improvement program was advanced by establishing 138 acres of new seed orchards and 349 acres of new seed production areas. Work continued on selection and testing of trees for superior genetic qualities and the grafting of approved selections in seed orchards.

Thinning operations were mostly in young conifer stands. Release operations were carried on in young hardwoods and in conifer reproduction overtopped by brush. In addition to accomplishments shown in the tabulation, 141,335 acres were burned over as a stand improvement measure to control understory competition in the southern pine types; 40,617 acres were burned to protect longleaf pine reproduction from brown spot disease; and 18,098 acres were burned to remove leaf litter and competition to create a favorable seedbed for natural regeneration.

OUTDOOR RECREATION

Uniform Measurement of Recreation Use

The use of the National Forests and other public lands for outdoor recreation continues to increase rapidly, and this makes more apparent the need for systematic interagency planning to meet recreation demands. The Forest Service and other land-managing agencies have cooperated in developing a new uniform measurement unit, the "visitor day," which will show the total amount of time spent by visitors at various types of recrea-

tion areas. The Forest Service is using this unit for the first time to measure the 1965 recreation use of the National Forests. The data are not yet available, but will be published later. There is no statistical correlation between the "visit" as reported in the past and the "visitor day"; however, it is evident that recreational use of the National Forests continues to increase as it has for more than 10 years.

A new recreation-information management system is in the development stage. This will utilize advanced automatic data processing methods to receive and store a wide variety of information essential to the proper planning, development, and management of National Forest recreation resources.

More Facilities Built

A large proportion of National Forest recreation use is dispersed over wide areas and makes use of only roads, trails, streams, wooded areas, or beautiful scenery. But other activities such as family camping and picnicking, winter sports, and boating require sites that are developed or modified to provide greater safety and enjoyment. To provide suitable accommodations for an increasing number of visitors, 841 new campgrounds and picnic sites were developed during the fiscal year. Typical site development includes tables with benches, fire grates, parking spots, tent sites, water, toilets, and refuse containers. According to the planned capacity, about 415,000 persons could be safely accommodated at one time on developed camp or picnic sites on the National Forests. Each family or party of approximately four or five persons would have its own individual parking spot, tent space, or picnic table.

As a rule, family units are spaced 3 or 4 per acre in groups of 15 to 30. The following tabulation shows the increase in the number and capacity of campgrounds and picnic sites during the fiscal year.

CAMPGROUNDS AND PICNIC SITES

	June 30, 1964	*June 30, 1965*	*Increase, 1964–65*
Number of developed sites	6, 388	7, 229	841
Area occupied (acres)	36, 364	41, 044	4, 680
Safe capacity at one time (persons)	389, 636	425, 295	36, 659
For tent camping (persons)	233, 332	255, 235	21, 903
For trailer camping (persons)	34, 853	40, 995	6, 142
For picnicking (persons)	121, 451	129, 065	7, 614
Family units available	75, 386	80, 485	5, 099

Other Developments

In addition to facilities for camping and picnicking, special developments are needed to accommodate skiers, organization camping groups, resort guests, swimmers, etc. Such developments are installed or improved with appropriated funds or through special use permits, under which facilities are constructed with private capital and managed for public use. Individuals or business organizations holding permits pay for the privilege of using the public land under an equitable fee system. The number of accommodations increased over the previous year as shown below.

WINTER SPORTS FACILITIES

	June 30, 1964	*June 30, 1965*	*Net change*
Number of developed sites	196	199	3
Area under permit (acres)	42, 469	45, 987	3, 518
Safe capacity at one time (persons)	241, 974	269, 082	7, 108
Uphill devices and jumps (number)			
Chair lifts	125	158	33
Gondolas	7	8	1
Platter pulls	68	72	4
T-bars	66	71	5
Rope tows	328	307	−21
Ski jumps	42	48	6
Total	636	664	28

SPECIAL FACILITIES

	Number available		
	June 30, 1964	*June 30, 1965*	*Net change*
Organization camps	573	573	0
Hotels, lodges, resorts, and other public service sites	611	608	[1] −3
Swimming sites	239	237	[1] −2
Boating sites	516	571	55
Observation viewpoints	292	315	23
	2, 231	2, 302	73

[1] Although new sites were developed, a net decrease resulted from changes in classification and losses caused by floods.

National Forest Wilderness

With the signing of the Wilderness Act on September 3, 1964, more than 9.1 million acres of National Forest land in 54 separate areas became the first units of the new National Wilderness Preservation System. The new act made it plain that Congress approved of the areas that had already been set aside administratively as "wilderness" and "wild" areas and the Boundary Waters Canoe Area. It endorsed in principle the wilderness concepts and management practices the Forest Service had been pioneering for four decades. The act made it necessary that those concepts and practices be formalized into policies, regulations, and instructions governing the management of National Forest Wilderness. Future management will differ little as to philosophy, but considerably as to degree.

The Wilderness Act also provides for review of 34 National Forest Primitive Areas occupying 5.5 million acres by 1974 to determine their suitability for inclusion in the National Wilderness Preservation System. These and other suitable lands administered by the Department of Agriculture, Forest Service, as well as those administered by the Department of the Interior, may be added to the system by act of Congress.

Acts of Congress and regulations of the Secretary of Agriculture relating to the Boundary Waters Canoe Area will continue in effect, as provided in the Wilderness Act. This unique area within the Superior National Forest in Minnesota will remain a center for primitive canoe recreation, and also provide other resource uses in specified zones.

Wilderness Actions

A wilderness manual was being developed for the guidance of forest officers in managing National Forest Wilderness. Proposed basic policies and general regulations were prepared and offered for public review and comment. These include regulations which apply specifically to the Boundary Waters Canoe Area and implement the Secretary's decision announced June 12, 1965, following the report of his special review committee.

In 1965, legal descriptions and maps were prepared for each Wilderness and submitted to the Congress as required by the act. Reclassification studies of several Primitive Areas were begun, and a public hearing was held on the Forest Service proposal to recommend the San Rafael Primitive Area in California for designation as wilderness. This is the first such action under the Wilderness Act. Others will follow as studies are completed.

The extent of Wilderness and Primitive Areas in each State at the end of the year is shown in the following table.

NATIONAL FOREST LANDS IN THE NATIONAL WILDERNESS PRESERVATION SYSTEM AND IN PRIMITIVE AREAS, DECEMBER 31, 1965

State	Wilderness Areas		Primitive Areas		Net area in both classes
	Units	Net area	Units	Net area	
	Number	*Acres*	*Number*	*Acres*	*Acres*
Arizona	5	420, 707	[1] 4	250, 936	671, 643
California	13	1, 256, 884	8	560, 399	1, 817, 283
Colorado	5	280, 104	6	554, 283	834, 387
Idaho	[1] 1	987, 910	3	1, 642, 388	2, 630, 298
Minnesota	[2] 1	886, 673			886, 673
Montana	[1] 5	1, 482, 567	4	417, 140	1, 899, 707
Nevada	1	64, 667			64, 667
New Hampshire	1	5, 552			5, 552
New Mexico	5	679, 398	[1] 3	335, 424	1, 014, 822
North Carolina	2	20, 975			20, 975
Oregon	9	665, 062	1	86, 700	751, 762
Utah			1	240, 717	240, 717
Washington	3	576, 589	1	801, 000	1, 377, 589
Wyoming	4	1, 780, 994	4	586, 000	2, 366, 994
Total	54	9, 108, 082	34	5, 474, 987	14, 583, 069

[1] Includes unit also located in adjacent State. Total adjusted.
[2] Boundary Waters Canoe Area.

Visitor Information Service

The Visitor Information Service entered its fifth year of operation, dedicated to interpreting various aspects of National Forest attractions and management for the enlightenment and enjoyment of visitors. Exhibits, self-guiding trails, demonstration areas, and talks are some of the interpretive devices used to highlight areas of historical, scenic, geological, or other scientific interest.

Visitor Information Centers have been and are being built on National Forests in areas of special interest. In 1965, two new centers—the Voyageur Visitor Center in the Superior National Forest in Minnesota and the Red Canyon Visitor Center in the Ashley National Forest in Utah—brought the total number in operation to six. Construction is underway on a center in the earthquake area of the Gallatin National Forest in Montana, and one each is planned for West Virginia and Oregon.

An onsite study was made and an interpretive plan drawn up for the Lewis and Clark Highway (Lolo Trail) in the Lolo and Clearwater National Forests in Idaho. In the George Washington National Forest in Virginia, a pilot project was set up to shape development of a self-guiding trail including determination of trail route, marker sites, signs, trailside exhibits, leaflets, and posters. The result was the Pig Iron Trail at Elizabeth Furnace Recreation Area, which was partially supported with funds contributed by the Children of the American Revolution. An interpretive trail developed at the Boy Scout Jamboree in Valley Forge, Pa., was used by 52,000 Scouts in 1 week.

SPECIAL USES AND MINERALS

National Forests and National Grasslands serve many other uses besides those related to renewable natural resources. These uses range from airport beacons to apiaries, from wayside stands to winter resorts. Such developments are authorized by special use permits issued to individuals, business establishments, civic groups, and government agencies that operate them. The number of permits

and the fees paid for them have been increasing steadily in recent years; from 79,000 permits in 1964 to 80,000 in 1965, with a $185,033 increase in receipts to a total of $2,433,827 paid into the U.S. Treasury during fiscal year 1965.

Determining Surface Rights

The multiple use mining law of 1955 provided that existing mining claims within the National Forests be examined under certain procedures to determine whether claimants were properly entitled to the surface values as well as to the subsurface mineral values, or if the surface rights should be in public ownership. This task involved approximately 1,200,000 claims covering 24 million acres scattered over 160 million acres of National Forests. Progress during 1965 brought the task to within 5 percent of completion.

Millions in Mineral Revenues

Lease of 5,414,007 acres of National Forests and National Grasslands for prospecting, exploration, and development of their mineral resources, including gas and oil, brought into the U.S. Treasury $4,336,207 in revenue during the fiscal year 1965. This is an increase of more than $900,000 over the previous fiscal year.

Another 10,156,000 acres of land in the National Forest System was under mineral prospecting permit or lease under the Mineral Leasing Act of February 25, 1920, relating to lands reserved from the public domain. Revenue attributable to such mineral development in the National Forest System for fiscal year 1965 is estimated at $18 to $20 million.

Atomic Energy for Gas Recovery

A remote area of the Carson National Forest within the San Juan Basin in northwestern New Mexico is being considered as a site for a proposed experiment to test the utility of nuclear explosives in gas production from low-productivity reservoirs. The objective is to increase and stabilize gas production by cracking the rock formation so as to create artificial passageways for the gas to the well bore. The proposed experiment is the result of findings by a feasibility study group composed of representatives of the Atomic Energy Commission, the Bureau of Mines, El Paso Natural Gas Co., and Lawrence Radiation Laboratories. It is part of the AEC Plowshare Program to develop peaceful uses for nuclear explosives in a variety of natural resource development, earth moving, and other projects.

On the basis of spacing one well per 160 acres, the nuclear experiment is predicted to permit total gas recovery in the first 20 years of up to 3.5 billion cubic feet, whereas conventional hydraulic stimulation recovery methods would yield 0.54 billion cubic feet. Nuclear stimulation would provide up to 67 precent recovery in contrast to only 10 percent recovery by conventional methods. If atomic fracturing proves commercially feasible, it could be applied to similar gas formations in Utah, Wyoming, Colorado, and Arizona, substantially increasing the Nation's accessible natural gas reserves.

As to safety, the study group found that the test can be conducted without serious hazard or problems. Atmospheric contamination would be extremely unlikely in view of the great depth (4,150 feet) and the small size of the explosion (10 kilotons). As in all nuclear experiments, extreme precautions would be taken.

Should the experiment be approved, 20 months would be needed from the first pre-shot hole to the post-shot production test. Well tests would be continued over a number of years to determine thoroughly the effects of the shot.

Coal Recovery Study Halted

All operations have been suspended on the cooperative coal recovery study that began early in the summer of 1963 in the Allegheny National Forest, Pa. In early 1965 the operator encountered low-quality coal with high ash content, and as the excavations approached the deepest cuts they uncovered a hard sandstone formation, costly to remove. Thus the mine became uneconomical to operate.

In spite of the unexpected recovery problems, the conservation aspects of the study have been encouraging. The owners have backfilled and leveled the disturbed areas, including the high wall, and the methods of acid control, spoil grading, and revegetation have been applied successfully as originally planned. The operations have had no measurable effects on the quality of water in the streams draining the area, and the spoil banks show very little water erosion. Artificial revegetation is progressing rapidly with no apparent problems of vegetation survival.

WILDLIFE MANAGEMENT

The Cooperative Approach

Wildlife management involves both wildlife populations and the environment or habitat where they live. Successful wildlife management requires planned action to control animal populations and to maintain desirable and productive habitat. In the National Forests and National Grasslands, the Forest Service and the respective State fish and game or conservation departments are partners in carrying out such wildlife management programs. This cooperation is essential because the State has the responsibility for authorizing and regulating hunting and fishing use and the Forest Service has responsibility for the habitat. Much of the habitat improvement work is done under jointly financed projects. The mutual objective is to sustain optimum wildlife populations on productive habitat for public use and enjoyment.

Cooperation with a wide variety of wildlife conservation groups—from bird watchers to archers

and from trout fishermen to big-game hunters—is also necessary to promote effective use and management of all National Forest wildlife resources.

Fishing and Hunting on Increase

The National Forests and National Grasslands contain choice habitats for many species of wildlife, including both game and nongame animals. They contain more than 2 million acres of lakes and reservoirs and 91,000 miles of streams which support many varieties of fish and other aquatic fauna.

Visits by hunters and fishermen during the last year increased by nearly 2 million over the previous year, reaching a new high of more than 30 million visits. A very large but unknown number of visits were made just to observe or study various wildlife species in their natural environment.

Grasslands Produce Wildlife

The National Grasslands are well suited for the production of various species of prairie grouse and waterfowl. On these areas, close coordination with range management practices and the development of wildlife food, cover, and watering facilities have significantly benefited sharp-tailed grouse, lesser and greater prairie chicken, quail, mourning doves, and various songbirds, as well as domestic livestock. Some of these prairie lands have possibilities for developing wetlands for waterfowl production.

An inventory of potential aquatic habitat developments has just been completed for the Chippewa National Forest in cooperation with the Bureau of Sport Fisheries and Wildlife and the State of Minnesota. The proposed developments could contribute materially to the waterfowl production in the North Central region of the country.

On other areas of the National Forest System special management practices are being used to meet the needs of rare and endangered species of wildlife and other fauna having particular local interest.

The Forest Service is also cooperating with the National Audubon Society in a nationwide inventory of nesting success among bald eagles, other large birds of prey, and the California condor.

Direct Habitat Accomplishments

The following listed habitat improvements were completed during the fiscal year in National Forests and National Grasslands. Of the total work completed, about 40 percent was financed by States under cooperative work programs. Wildlife project work and coordination planning accounted for the remaining accomplishment. All work directly benefited wildlife.

Wildlife food and cover improvements:		
Seeding and planting forage	43,156	acres
Release of forage plants	31,828	acres
Prescribed burning	44,572	acres
Protecting key wildlife areas	33,147	acres
Permanent openings	5,405	acres
Small water developments for wildlife:		
Ponds, troughs, guzzlers, etc	1,019	items
Waterfowl wetland improvements	3,281	acres
Fish stream improvements:		
Channel structures	2,157	items
Spawnbed improvements	12	miles
Stream barrier removal	1,316	items
Protecting stream channels	46	miles
Rough fish removal	140	miles
Fish lake improvements:		
Aquatic plant control	1,429	acres
Rough fish removal	44,981	acres
New fishing lakes	827	acres
Fish shelters and spawnbeds	192	items

RANGE MANAGEMENT

Pasture for 6 Million Livestock

As provided by the Multiple Use-Sustained Yield Act and other legislation, grazing resources within the National Forests and National Grasslands are administered for sustained forage and livestock production consistent with proper use of other resources. Farmers and ranchers in 38 States graze their livestock on these public lands under permit. In 1965, range allotments in the National Forest System provided grazing for about 6 million head of cattle and sheep, including offspring.

Permit Form Revised

Nearly 20,000 permittees currently have grazing permits. The majority of these are 10-year term permits, expiring at the end of calendar year 1965. In preparation for the new 10-year period, the grazing application and permit forms have been revised. The new term permits to be issued in 1966 will be signed by the grazing permittee as well as the Forest Supervisor. This will give the grazing permittee a better opportunity to become familiar with all the requirements and provisions of his specific permit.

Cooperation—Key to Range Programs

Developments in 1965 emphasized that cooperation is the key to successful range programs. Grazing management and improvement programs on the National Forests and National Grasslands are jointly planned and carried out by the Forest Service and range users. User cooperation includes managing livestock to conform to prescribed plans; maintenance of fences and other structural improvements; deferred grazing to facilitate an improvement project; contributions of money, time, labor, or materials; and private investment for improvement of Federal lands.

Results of some of these cooperative efforts are documented in the movie "Ranchers and Rangers" recently produced jointly by the Colorado Cattlemen's Association, Colorado State University, and the Forest Service.

This movie illustrates work carried out on National Forests in Colorado in cooperation with the Colorado Cattlemen's Association Range Improvement Committee. Examples in the movie include the Mule Park allotment on the Gunnison

National Forest where the stocking has been increased from 291 to 400 head of cattle since 1959, through fencing, water development, and more intensive management.

Similar results of cooperation were also reported during the year in other areas. Near Preston, Idaho, in the Cache National Forest, for instance, cooperative management and range improvement resulted in a forage production increase on the Cub River allotment from around 400 to 1,600 pounds per acre. Improvement and management have been carried out under a cooperative agreement with the Cub River Stockmen's Association. Similar results were obtained in National Forests in Utah.

Cooperation with major national livestock associations representing a majority of the livestock permittees continued in 1965. Problems of mutual concern were discussed at national, State, and local association meetings. In addition, the Forest Service collaborated with national officials of the American National Cattlemen's Association and the National Wool Growers Association in sponsoring a joint field meeting of national committees of these two organizations.

Grazing Fees Bring in $3.5 Million

Current 1965 fee levels for cattle grazing on the National Forests and National Grasslands range from 10 cents to approximately $1.50 per animal month; fees for sheep grazing, from 3 cents to 34 cents per sheep month. Revenues from grazing use on all lands administered by the Forest Service amounted to $3,518,580 in 1965.

Grazing Fees Under Study

In cooperation with agencies of the Departments of Defense and Interior, through the Interdepartmental Grazing Fee Committee, the Forest Service continued work to implement the recently issued Bureau of the Budget directive governing establishment of fees for livestock grazing on Federal lands. Bureau of the Budget and congressional interest in user charges for publicly owned natural resources has stimulated efforts to evaluate the grazing fee situation on Federal lands and to develop a uniform basis for user charges.

To provide sound methods for estimating the value of public land grazing use to livestock producers, the Forest Service program of range economic studies was continued in 1965. Three cooperative projects carried out by State universities in the West for the Forest Service and Bureau of Land Management were completed and final reports submitted to the Federal agencies.

A new project was begun with Utah State University to apply the results of previous studies to determine grazing values and fee levels for the National Forests in Utah. Utah is being used as a pilot area in developing procedures and computer programs for evaluation of grazing fees on the western National Forests. The Utah project is scheduled for completion in June 1966. A target date of 1968 has been set for fee adjustments on the National Forests in the Western States.

Range Analysis Progressing

Information about the range and related resources is collected and evaluated through a program of range allotment analysis, which is needed to keep management systems current. A goal of periodic review has been set so that up-to-date resource inventories will be at hand. In this work, the nature and kind of vegetation is studied, topography and lay of the land are looked at to find areas where livestock can properly graze, and opportunities exist for range improvement and development. This and other related information are carefully analyzed in cooperation with the permittee or group of permittees involved, and put together in a management plan for a specific allotment. Analysis is accomplished locally for each of the 11,600 allotments.

Five hundred fifty-four allotment units of work were accomplished in 1965. The present goal is to complete the allotment analysis job by the end of fiscal year 1969. Intensive management systems based upon the results should be in full operation on approximately 70 percent of all Forest Service grazing allotments by that time. In addition to the initial analysis work done in 1965, reviews of previously completed work were made to update basic findings. Range condition trend data was collected from established sampling areas.

Findings of range allotment analyses and management planning are the keys to full and optimum resource use of the National Forests and National Grasslands for livestock grazing in conjunction with other resource requirements and uses.

Range Improvements

A continuing program of range improvement includes the construction and maintenance of range improvements needed for more intensive management of the range resource, revegetation, and plant control. Significant progress is being made in correcting long-term problems associated with deteriorated or depleted ranges that were once overgrazed.

In fiscal year 1965, $6,017,000 was appropriated to the Forest Service for work on improvements and revegetation essential to the management of National Forest range resources. Approximately 28 percent of this fund was expended for maintenance of the existing 54,300 miles of fence and 38,000 watering places.

Permittees Help With Range

On the National Forests and National Grasslands, range users maintained fences, water developments, and other structural improvements on grazing allotments, and contributed money, time, labor, and materials toward new developments. These contributions by range users in fiscal year 1965 for all range improvement work were valued at about $966,000, of which about $259,000 represented contributions toward maintenance. Con-

tinued cooperation of this nature is essential and must be increased to accomplish range management objectives under current financing.

1,800 Miles of New Fence

The range improvement program includes constructing facilities for effective control and management of livestock. It also includes replacement of undesirable vegetation with plants of economic and esthetic value. In fiscal year 1965 some 70,000 acres were revegetated through range seeding; undesirable plants and noxious farm weeds were controlled on 156,000 acres; rodent control measures were carried out on more than 7,000 acres; and 5,500 acres were treated by fertilizing, water spreading, pitting, and other measures. Construction of range improvements included approximately 1,800 miles of range fence, 265 cattleguards, and 1,940 animal watering places.

Grazing on Increase in South

The Forest Service is moving ahead rapidly to properly manage the substantial grazing resources of the National Forests in the southern United States. Range analyses are being made, management plans developed, and livestock use authorized under the same type of permit system long in effect on western National Forests. On a number of southern areas, livestock were grazed under permit for the first time in 1965.

Knowledge obtained through research at the Southern and Southeastern Forest Experiment Stations is used to manage livestock and grazing use on southern forest lands in harmony with timber growing and other resource uses.

The attainment of proper management of these lands has been slow and difficult because the National Forests in the South were established through piecemeal purchases, and because of economic conditions and local customs. Restrictions or changes that are not in accord with long-standing customs and usage can cause considerable concern to the local citizens, many of whom fear that their means of livelihood are jeopardized by a permit system. It is recognized that benefits of managed grazing on the southern National Forests will not be apparent at the outset to all the people involved. However, proper management of the grazing resources in the South, as elsewhere, will in the long run benefit the local people as well as the rest of the Nation.

WATERSHED MANAGEMENT

The importance of water to the Nation's well-being received emphasis at the highest level. The President signed into law three major bills providing for better water management: (1) the Federal Water Project Recreation Act, (2) the Water Resources Planning Act, and (3) the Water Quality Act of 1965. All have significance in National Forest administration, for the headwaters of many of the streams and rivers of the East are located within National Forests and, of major significance, over 50 percent of the water supply of the West originates on National Forest lands. Full application of scientific knowledge in the management of National Forest System watersheds will continue to receive major attention.

Water Resource Program

During the year, 57 watershed scientists working on 39 National Forests completed detailed hydrologic surveys and analyses on 2.9 million acres of National Forest lands. These detailed surveys and analyses are the basis for comprehensive watershed management plans which contain the prescriptions for improving water yield in terms of quality, quantity, or timing of runoff. Based on this scientific evaluation, 25 water yield improvement projects were undertaken or continued on selected watersheds. Typical treatment included installation of snow fences to increase snowpack and thus increase and prolong water yield; cutting timber in prescribed patterns for the same purpose; and conversion of vegetation from trees or brush to grass to increase water yield.

In addition to the comprehensive surveys, specialized watershed surveys were completed on over 1.5 million acres. These surveys provide the information necessary to identify and prescribe treatment for specific problems such as an eroding streambank, a flood source area, and acid leaching strip-mined area, or a gullied mountainside. They help assure that activities such as timber harvesting, road construction, recreation development, and mining are conducted so as to avoid serious erosion or deterioration of water resource values.

Full establishment of our system of barometer watersheds continues to receive emphasis. To date, 21 barometer watersheds have been designated. These watersheds, selected as typical of their hydrologic province, form the scientific means of adapting research findings to operational water yield improvement programs. Fully instrumented, they serve as a sampling system to establish the effect of resource management and development practices on the quantity and quality of water yield.

Progress was made in restoration of deteriorated areas within National Forest watersheds in fiscal year 1965. Over 30,000 acres were treated to control erosion, including 16,000 acres of sheet erosion and 262 miles of gully erosion. Some 200 miles of streams were cleared to prevent bank erosion. Eroding streambanks and shorelines were stabilized, resulting in direct benefit to 140 miles of streambank and shoreline. On 552 projects, 2,282 miles of abandoned roads and trails that were seriously contributing to soil erosion were stabilized. Immediate first-aid treatment of burned areas continued. Over 139,000 acres of potential flood and sediment producing areas were rehabilitated.

Soils Program

Information provided by soil surveys can help assure maximum effectiveness in coordination of resource uses and activities and minimum adverse effects of activities causing soil disturbance. Basic soils information is necessary for wise, farsighted resource management.

Standard soil surveys provide information necessary to gear resource and development activities to the capabilities of the wide variety of soils found in National Forests. These surveys are fully coordinated with and become a part of the National Cooperative Soil Survey being conducted by the Soil Conservation Service. The standard survey is supplemented by reconnaissance level surveys to meet selected management needs over large areas. Forest Service soil scientists also provide localized soils information for specific projects such as selection of a nursery site, locating roads through fragile soil mantles, or designing individual rehabilitation projects. In fiscal year 1965, standard soil surveys were completed on 2.2 million acres; reconnaissance surveys were completed on an additional 1.5 million acres. Specific soil management services were provided for 347 projects.

Multiple Use Surveys

Multiple use surveys delineate the effects of reservoirs or other water resource developments upon the protection, administration, and management of the National Forests and National Grasslands. The reports, based on survey facts, document items that are essential to the attainment of multiple use objectives when National Forest lands are related to the project. To be effective, the surveys and reports must be available to aid in the construction agency's preliminary planning and without fail must precede licensing or authorization. During the construction period liaison with the construction agency (such as Corps of Engineers or Bureau of Reclamation) is necessary for coordination. Protection of the land and resources, minimizing interference with regular protection and management activities, and facilitating construction agency operations are direct economic dividends derived from this program.

In fiscal year 1965 multiple use surveys were made and/or construction liaison provided on 283 projects. Among these were the Libby Project in Montana, Lower Canyon and Penny Cliffs in Idaho, San Juan-Chama in Colorado and New Mexico, Central Utah in Utah, American River in California, Allegheny in Pennsylvania, Upper American River in California, Baker in Washington, Rowlesburg in West Virginia, Cave Run in Kentucky, French Broad in North Carolina, and Lee Creek in Arkansas.

Restoring Damaged Watersheds

As a result of the Appalachian Regional Development Act, restoration work was accelerated on National Forest lands damaged because of mining operations. Watershed restoration work was started on some 19 National Forest projects. Objectives are to restore the esthetic and resource capabilities of damaged areas and to restore water quality in streams affected by mining operations. The Forest Service is also cooperating in the nationwide surface and strip mine study called for in the Appalachian Act and begun in 1965. The Forest Service will play a major role in evaluating the nature, scope, and effects of—and treatment needed on—surface-disturbed areas.

A joint Forest Service-Public Health Service study to determine the effects of activities such as timber harvesting and public recreation upon water quality was started. Watersheds involved are the Green and Cedar Rivers in Washington and the Clackamas in Oregon. Findings of this study will be important in guiding future management of National Forest watersheds that supply water to municipalities.

As the USDA representative on the Wild Rivers Study Team, the Forest Service completed studies in depth on segments of rivers being considered for initial designation as Wild River Areas in the proposed National Wild Rivers System. Rivers or segments of rivers studied included the Middle Fork and a segment of the main Salmon in Idaho, the Middle Fork of the Clearwater in Idaho, the lower Rogue in Oregon, and an upstream segment of the Eleven Point in Missouri.

ENGINEERING

Roads and Trails

The National Forests in the Northwest suffered heavy damage to the road and trail systems during the fiscal year. The June 1964 floods in Montana and Idaho damaged 426 miles of road, 770 miles of trail, and 55 bridges. Repair costs were approximately $9 million.

Extensive storms and floods in California, Oregon, Washington, Idaho, and Nevada in December 1964 and January 1965 destroyed or damaged 9,000 miles of road, 4,455 miles of trail, and 257 bridges. The loss was estimated at approximately $49 million. Emergency repairs were started immediately, and were subsequently furthered by an allocation of $38 million to the Forest Service under the Northwest Disaster Relief Act.

National Forests at the end of fiscal year 1965 were served by a transportation system consisting of 188,133 miles of forest development roads, 102,948 miles of trails, and 429 landing fields for fixed wing aircraft. Construction and reconstruction from regular Forest Road and Trail funds included 1,613 miles of road, 671 miles of trail, and 175 bridges. Funds obligated for maintenance, flood repair, and construction from FR&T authorizations amounted to $105.5 million, and $2.3 million from miscellaneous sources.

In addition, purchasers of Government timber under the terms of timber sale contracts constructed or improved 4,362 miles of road at an

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estimated cost of $56.7 million and provided maintenance on 20,317 miles of road appraised at $7.2 million.

Vehicles and Construction Equipment

Four cost analysis studies were conducted in California, Oregon, Utah, and Virginia to determine the economics of Forest Service ownership of fleet vehicles. In these cases, it was found that it cost the Government less for the Forest Service to own and operate its own vehicles than to rent vehicles from commercial or other sources. Additional studies are planned in collaboration with the General Services Administration.

In fiscal year 1965 the Service owned, operated, and maintained a fleet of 11,094 vehicles, 600 crawler tractors and loaders, 300 motor graders, and over 15,000 other items of equipment. More than 95 million miles were traveled in all Service vehicles in the work of protection, research, management, and administration. During the year the Forest Service obtained a fleet of 1,057 vehicles from military surplus and other sources for Job Corps programs.

Improved Equipment

Changed technology in the field of insect control led to successful development of a mobile mixing and service unit. This unit can handle, mix, and deliver insecticides without endangering the operator. It can mix small quantities of insecticide in large volumes of water or other carriers with great accuracy.

Other developments include procedures for testing protective clothing for chain saw operators in cooperation with the American Pulpwood Association; a pneumatic pine seeder that handles many sizes of seed; and a mobile sign maintenance shop.

Buildings

Under construction were 26 major buildings costing approximately $4 million. These included 4 Visitor Information Centers, 5 research laboratories, 6 tree nursery buildings, and 11 fire and general purpose buildings. Over 40 Job Corps Conservation Centers were built at a cost of $29 million.

Surveys and Maps

For effective management of the National Forests and Grasslands, accurate maps are needed for an aggregate of 632,179 square miles. While this coverage is not currently available, map production is steadily increasing. In 1965 the Forest Service produced planimetric maps of 31,844 square miles and topographic maps of 2,120 square miles. This brings the total mapping coverage to 56 percent of the required area for planimetric and 41 percent for topographic mapping.

Property Corners and Lines

Since 1958 the Forest Service has been engaged in a continuing program of searching for property corners and land lines, remonumenting corners on the basis of remaining evidence, and relocating corners by cadastral survey. The locating, marking, and posting of property lines needed for the effective management of the National Forest System depend on the progress of the corner search and monumentation phase of the program. This year the Forest Service has worked with the Bureau of Land Management in a cooperative cadastral surveying program to relocate missing property corners needed to establish Forest Service property lines.

In 1965 field search was made for 22,564 corners, and 13,792 corners were remonumented with permanent monuments. Corners could not be located in 7,842 cases. These will need expensive cadastral surveys to fix their positions. A total of 1,385 miles of property lines were located, marked, and posted to full standards; also 1,847 miles were adequately marked and posted so that they can later be marked to standard without retracement.

LANDS

Only about half of the land inside the National Forest boundaries in the Eastern United States is National Forest land. The percentage is greater in the West—about 90 percent—but in the East and West alike much private and other non-Federal property is intermingled with National Forest land in such a manner that administration is difficult and costly. This broken pattern of ownership handicaps effective multiple-resource management in many National Forests. Many private owners in the National Forests also are at a disadvantage because their holdings are not consolidated for greatest efficiency. Therefore, land-ownership adjustments are planned for almost all National Forests. Although much of the non-Federal lands, such as townsites and cropland, will obviously remain in private ownership, it is possible to work out needed ownership changes with owners of intermingled lands.

Purchases and Exchanges

A total of 208 purchase cases involving 29,056 acres were approved for purchase during the year. Included were 46 tracts to be acquired with moneys from the Land and Water Conservation Fund made possible by Public Law 88–578 approved September 3, 1965. This new purchase program is to acquire lands primarily valuable for outdoor recreation. The funds made available to the Forest Service will be used to purchase properties that will enable the National Forests to accommodate more effectively public demands for outdoor recreation.

Twelve individuals donated land to the Forest Service in 1965, adding 1,354 acres in all to the National Forest System.

One hundred twenty-eight land exchanges were approved during the year. The United States will receive 115,828 acres, and will grant in exchange 80,767 acres and in some cases cutting rights to certain National Forest timber selected by exchange proponents. Completion of these exchanges will reduce property lines in need of location and monumentation by 1,028 miles, reduce road construction needs by 105 miles, eliminate the need for 252 rights-of-way cases, and reduce special-use permits and occupancy trespass by some 156 cases.

Changes in lands administered by the Forest Service for fiscal year 1965 are as follows.

	Acres
Total area administered by Forest Service (owned by United States) June 30, 1964	186, 302, 639
Increases:	
Purchased	35, 234
Conveyed to United States in exchange	63, 887
Donated to United States	1, 162
Transferred from other Federal agencies	1, 028
Reserved from public domain	8, 822
Found by status check to be U.S. land	12, 005
Recomputations, adjustments, and miscellaneous	21, 034
Total	143, 172
Reductions:	
Conveyed by United States in exchange	38, 756
Grants, sales, reconveyances, mining patents, homesteads, etc	1, 592
Transferred to other Federal agencies	1
Eliminated from National Forests and returned to public domain status	4
Recomputations, adjustments, and miscellaneous	41, 273
Total	81, 626
Net increase	61, 546
Total area administered by Forest Service (owned by United States) June 30, 1965	186, 364, 185

Land Status

Since the Service-wide review and compilation of accurate land status records began in 1961, work has been completed on land records for 4,800 townships (2,200 during 1965) out of the 17,153 in the National Forest System. This project is providing up-to-date, reliable records for use by field personnel in their complex multiple-use management job. Records have been completed for 28 National Forests and 6 additional Ranger Districts. Work is underway for 27 National Forests and 12 additional Ranger Districts.

Rights-of-Way

Over the past 6 years more than 5,000 rights-of-way have been acquired by the Forest Service. They provide improved public access for use and enjoyment of the resources of many thousand acres of National Forest lands. During fiscal year 1965, 1,473 rights-of-way involving 1,075 miles of proposed and existing roads were obtained—the highest number for any year.

In addition agreements were completed for cooperative road construction and use covering more than 3,500 miles of road. These roads provide access to large areas of intermingled private and National Forest land. In 1965, 21 such agreements were consummated; these involve 746 miles of road with a total value of $7.3 million.

A new law, usually referred to as the easements bill (P.L. 88–657), approved October 13, 1964, authorized the Secretary of Agriculture to grant to cooperators easements for road rights-of-way across Forest Service administered lands. During the year regulations were issued to implement the new law. The easement form to be used for granting the U.S. Department of Agriculture easements and the form to be used by cooperators in their grants to the Government were developed with the close cooperation of the forest products industry. The new law, regulations, and easement forms will facilitate the exchange of reciprocal rights on cooperatively constructed roads across intermingled National Forest and private lands.

Major Actions

Following studies of the Highlands area in eastern Kentucky, a purchase unit grossing 591,000 acres was approved by the National Forest Reservation Commission in 1965. Purchases and programs will be undertaken for purposes that include rehabilitating watersheds which have produced disastrous floods, restoring quantity and quality production of forest products, and encouraging public use of outdoor recreation resources. This program relates directly to the objectives of the Appalachia Regional Development Act. Studies were completed concerning economic effects on a depressed area in Arkansas that would result from enlargement of the Ozark National Forest. Joint field studies with the National Park Service of a half-million-acre area in Idaho were completed. The studies relate to legislative proposals that a Wilderness National Park be established from parts of three National Forests.

Modification of National Forest boundaries in 1965 by special legislation resulted in transfer of 5,450 acres from the Sierra and Sequoia National Forests in California to the adjoining Kings Canyon National Park; addition to the Kaniksu National Forest in Idaho of three parcels of private land at Upper Priest Lake needed to maintain an outstanding natural setting; and adjustment of boundaries common to the Jewel Caves National Monument and Black Hills National Forest in South Dakota. Legislation authorized appropriation of funds to purchase 10,000 acres of watershed lands within boundaries of the Uinta National Forest in Utah primarily for the protection of the water supplies of valley populations.

An area of about 5,700 acres was eliminated by public land order from the Carson National Forest in New Mexico to facilitate adjudication by the Bureau of Land Management of long-standing claims to title involving parts of a Spanish land grant. Following joint studies, a request was made for a public land order that would adjust

jurisdictions between the Forest Service and Bureau of Land Management on more than 66,000 acres in Montana. Isolated tracts of vacant public domain totaling some 38,000 acres would be added to adjacent National Forests, and the Little Rockies Division of the Lewis and Clark National Forest, nearly 28,000 acres in an isolated unit, would become part of a surrounding unit administered by the Bureau of Land Management.

Numerous small adjustments of boundaries and jurisdictions in the interest of more effective management of Federal land added some 9,700 acres to the National Forests and excluded about 1,300 acres.

A major adjustment by Executive order shifted boundaries common to the Okanogan and Wenatchee National Forests in the State of Washington. This action better alines these administrative units with respect to their accessibility from their headquarters. Another Executive order extended boundaries of the Allegheny National Forest in Pennsylvania to provide for a unified administration of recreation development and use at the Allegheny Federal reservoir project.

FIRE CONTROL

1965 Fire Season

The 60th anniversary year of the Forest Service was marked by the lowest burned acreage in the organization's history. Favorable weather conditions in parts of the country, an efficient, well-trained organization, and use of modern techniques and equipment all contributed to this good record. From January 1 to December 31, 1965, 9,337 fires burned 76,585 acres within National Forest protection areas. This compares favorably with the 5-year average (1960–64) of 12,395 fires that burned 208,974 acres. The previous record for the least acreage burned was set in 1962 when 85,457 acres burned.

Fire weather in most areas was favorable for controlling fires at small size through September. A flurry of large fires in Arizona and New Mexico in late June was due to dry lightning storms accompanied by strong winds. A critical weather period in mid-September in southern Oregon and northern California was passed with few fires and low burned area in the National Forests. A disastrous fire in Nebraska in May destroyed one-third of the Nebraska National Forest, the only one in the State and the largest planted forest. Severe winds and low humidity caused this fire to spread very rapidly. It was only through heroic work of the firefighters, largely local residents, that the fire was kept from burning the village of Halsey and doing much greater damage.

Accidents took the lives of six firefighters during the year.

Prevention and Fire Law Enforcement

Several test areas were used for accelerated fire prevention methods. Fire occurrence trends are definitely down in these areas compared with a slight upward trend nationwide. Increasing rail shipments and aging diesel locomotives have caused an upswing in the number of railroad fires. Special efforts were directed to get facts on exhaust spark elimination, treatment of fuels along railroad rights-of-way, and similar preventive practices.

The Forest Service has initiated stonger fire law enforcement throughout its organization. Criminal investigators have been employed to assist in the investigation of difficult fire cases. These men train others in the technical aspects of fire investigation and handle the more complicated cases directly. Prompt attention and persistent followup on preparation of trespass cases have produced greater recovery of suppression costs and resource damages from those responsible for causing fires. Forty-six cases were closed in 1965 compared with 18 in 1964.

Authority was given to field offices in June to refer certain cases directly to Regional Attorneys of the Department of Agriculture. The Regional Attorney is authorized to refer these cases to the appropriate U.S. Attorney. This will speed up case processing, with more cases handled directly by field offices, will save administration costs, and perhaps result in settlements more favorable to the Government.

Fire Management

A strong campaign to cut firefighting costs produced remarkable results in 1965. The central theme was to make every man a "watchdog" on costs. Guides were written to instruct fieldmen on when and how to use the costly, but highly effective air tankers. More use was made of Forest Service organized crews instead of hiring "pick-up" firefighters, who tend to be costly and inefficient. Economies in the use of equipment and supplies were stressed. Job Corpsmen were used effectively as they were trained and available. Improved firefighting equipment continued to pay big dividends through greater economy, efficiency, and safety. Among the new items in use were the flail fireline trencher, small lightweight portable pumps, and improved smokejumping equipment.

Fire Control Training

Extensive use of fire control simulators for training forest officers has provided more competence in handling complex fire situations. Simulators produce realistic exercises in the absence of actual fires. New simulators designed for greater portability were used to reach more first-line firemen at their duty stations. A new programed text has permitted firefighters and leaders to study fire safety individually rather than at more costly group sessions. A National Air Operations course during the year gave formal training to regional representatives who, in turn, conducted local schools to improve efficiency of air support in the control of forest fires.

Air Attack Progress

Increased use of air tankers for dropping retardants to control fires and unpredictable fire-season needs have led to certain contracting problems. Because safe and effective tanker use was not possible with marginal operators, the Forest Service made a study of contracting procedures in 1964 and developed a new policy based on the findings. A new contract used in 1965 provides for negotiation with the most qualified operators, rather than unrestricted competitive bidding. Special attention is given in selecting operators on the basis of pilot experience, training, safety records, and service facilities. The higher requirements appear to meet the objectives of safe, efficient air service and to stabilize the air tanker industry. This procedure should materially reduce air tanker costs in the years ahead.

The best time to fight fires is at night when they do not spread so rapidly and temperatures are more favorable for men on the fireline. Tests during the last 2 years have shown that helicopters can be used at night to get men to and from fires in mountainous country. Special lights and markers have been developed for greater safety in such flying. Many field units have completed plans for helispots and heliports which tie in with plans for ground attack. This will result in more efficient and economical firefighting.

Greater safety for pilots and firefighters is an objective of procedures devised to measure fatigue under conditions to which these men are commonly exposed. In addition, a helicopter rescue litter was developed.

Fire Alerting Systems Expand

The new National Fire-Danger Rating System developed by the Forest Service is being used in nearly all parts of the country. Orientation and training of fieldmen in the use of this system has produced better preparedness and fire management. The U.S. Weather Bureau has added several fire-weather forecasting offices throughout the country, and forecasts are being made daily to aid presuppression and suppression work.

FORESTRY RESEARCH is carried on by the Forest Service at its nine regional Experiment Stations, the national Forest Products Laboratory, the Washington Office, the Institute of Tropical Forestry, and with cooperating universities. Scientists study the growth and harvesting of timber; protection of forests from fire, insects, and disease; management of rangelands and wildlife habitat; outdoor recreation; protection and management of watersheds; efficient and economical utilization of forest products; and forest economics. A continuing forest survey provides comprehensive information on the extent and condition of forest lands, the volume and quality of timber resources, trends in timber growth and harvests, and the outlook for future supplies and demands.

Forestry Progress Through Research

In Georgia, a number of forest owners are buying slash pine seedlings from the State at $10 per thousand, even though the regular nursery price is $4.50 per thousand. But they are getting a bargain, for their seedlings are the first commercially available production of genetically improved trees from the tree seed orchards developed by the Georgia Forestry Commission in partnership with research at Macon, Ga.

These "quality" seedlings represent a major effort to grow the best possible trees in the forests of the future. Throughout the range of slash pine, foresters and geneticists sought out the "plus trees," trees meeting the most stringent of standards. Only one tree in several hundred thousand qualified, but from them, cuttings were taken and grafted in the seed orchards for further study and breeding. Seedlings from the seed orchard seed should be 10 to 50 percent better than the standard nursery seedlings.

Through much basic and applied research, forest geneticists have learned that many tree characteristics are heritable and can be controlled. Geneticists now can breed trees for more rapid growth, good crown form, early natural pruning of dead limbs, and resistance to insects and disease. This research promises to improve many species.

Since 1950, the Forest Service, the States, and forest industries have established 130 tree seed orchards covering an aggregate of 2,383 acres. Better seeds are also being produced on 222 seed production areas covering 7,235 acres, where cull trees have been removed to leave stands of high-quality seed-producing trees.

These new developments represent the application of the findings of the research of the Forest Service, States, and industries in just one field of forestry science.

TIMBER MANAGEMENT RESEARCH

Yellow-Poplar Reproduction

Detailed studies of the reproductive habits of yellow-poplar are providing reliable methods for regenerating this valuable species after clear cutting. A recent study in Illinois and Indiana showed that yellow-poplar seed have remained viable for at least four winters in the forest litter. Under natural conditions viable seeds accumulate for several years and germinate when seedbed conditions are suitable. Some seeds germinate in the forest litter before harvest cutting, but the seedlings rarely live more than one growing season. Natural stratification on the forest floor for one winter does not break dormancy in all seed, but after stratification for two winters most of the seed will germinate if other conditions are favorable. These findings indicate that there is little need to reserve yellow-poplar seed trees on harvested areas if harvest cuttings are made so as to create favorable seedbed conditions.

Stocking Levels for Loblolly Pine Studied

One of the most useful studies in management planning thus far attempted was recently completed for loblolly pine in the Southeast. Comprehensive information on the growth and yield of

managed stands of loblolly pine in the Southeast provided the foundation for an economic analysis of management for maximum profit. The analysis considered varying stumpage prices, stand ages, site indexes, stocking levels, interest rates, and regeneration costs for pulpwood or sawtimber. Stocking levels in loblolly pine which provide the greatest profit are less than those which yield the maximum volume production. Optimum rotation ages for specified interest rates and site qualities varied from 25 to 35 years for pulpwood only, from 35 to 55 years for sawtimber disregarding quality improvement with age, and from 40 to 70+ years with a quality differential. Low interest rates, better sites, and higher regeneration costs favored longer rotations.

New Pines From Needle Bundles

Studies at Rhinelander, Wis., have shown that jack pine can be successfully raised from rooted needle fascicles, provided that the fascicles are taken from young trees and possess well-developed buds. This has important application to the problem of cheaply propagating large numbers of genetically identical plants from exceptionally desirable pine trees. Related studies are being conducted abroad under Public Law 480 to solve the difficult problem of propagating pines from the needle fascicles of older trees.

New Hybrid Pines Resist Pests

To determine their range of adaptability, eight varieties of hybrid and native pines were planted in 1950 at elevations between 5,280 and 6,420 feet in the central Sierra Nevada of California. After 12 years of growth in a variety of environments, the backcross hybrid Jeffrey × (Jeffrey × Coulter) appeared to be the tree species with the most promising potential—it grew well and suffered little damage from snow or porcupines. In addition, it also resisted tree-killing weevils and bark beetles found in this region. This backcross hybrid is now being bred in large numbers for planting on the National Forests in California. It should perform as well as the more susceptible native ponderosa and Jeffrey pines up to about 6,000 feet elevation.

New Facts on Mycorrhizal Fungi

Findings of a Public Law 480 project in Finland have shown that neither soil sterilant treatment in nurseries nor slash burning in the forest seriously inhibit mycorrhizae, the symbiotic fungi considered essential for good growth of most trees. Mycorrhizal development was delayed on pine and spruce seedlings after nursery soil had been treated with various sterilants to control weeds and disease, but by the end of the growing season, mycorrhizal development and seedling growth equaled or exceeded the development in untreated soil. Similarly, slash burning retarded but did not prevent mycorrhizal formation; high surface temperatures did not penetrate deeply enough to kill fungi, and the release of alkali bases did not raise pH levels enough to inhibit the fungi. This knowledge removes doubts concerning the possible damage to mycorrhizae caused by these particular silvicultural practices.

Improving Pine Gum Quality

For some years the accepted method of turpentining southern pines has included spraying a 50-percent solution of sulfuric acid on the fresh wound to stimulate the flow of oleoresin. This method cuts in half the necessary frequency of wounding, and thus prolongs the productivity of the tree. But the acid is hazardous to workers and corrodes the metal cups and gutters used for gum collection.

Recent research indicates that these hazards might be avoided by substituting 2,4-D for sulfuric acid. A 4-year comparison of the two stimulants showed that a 2-percent solution of 2,4-D provided just as much gum yield as sulfuric acid. Corrosion of metal cups and gutters was greatly reduced. With sulfuric acid, iron contamination from the corroded metal progessively lowered the grade of gum after the first year, whereas with 2,4-D the grade of gum remained high over the 4 years. Although this use of the 2,4-D solution kills longleaf pine, the new technique should improve naval stores practice on the large acreage of pure slash pine plantations now coming into production for naval stores.

New Handbook Aids Tropical Foresters

In 1965 the Forest Service published the comprehensive book, *Common Trees of Puerto Rico and the Virgin Islands* (Agriculture Handbook 249), which describes the characteristics, size, appearance, wood uses, and distribution of 250 common native trees of these islands, plus another 130 related species. This valuable reference text will aid foresters, teachers, students, and others who work with or are interested in these tropical American species.

Prescribed Burning in Aspen Forests

Nearly a third of the forest land in the Lake States is now in aspen, much of which could profitably be converted to conifers if the aspen can be removed, and if the sprouting of suckers can be prevented. Cooperative studies in Minnesota have shown that this can be accomplished by two or more annual prescribed burns in the spring while the trees are still dormant. Two or three successive burns left an area surprisingly clear of debris and aspen competition. Of the brush and hardwood species studied, aspen is the only one that shows a decline in vigor and less sprouting after repeated dormant season burning.

FOREST SOIL AND WATER RESEARCH

Special Timber Harvest Increases Snowpack

On the western slopes of the Sierra Nevada in California, a specially designed pattern of timber cutting has greatly increased snow accumulation

and delayed the rate of snowmelt. Logged strips were oriented so as to minimize direct exposure of the snow cover to the sun. In these clear-cut areas the snow water content was 43 percent greater than in the adjacent uncut forest. At maximum accumulation in 1 year, clear-cut strips contained a snowpack equivalent to 27 inches of water, partially cut strips contained 22 inches, and uncut forests, 19 inches. In a related study, the application of evaporation suppressants reduced open-area snowpack losses from evaporation by 86 percent. The chemical, hexadecanol, did not significantly retard evaporation under the forest canopy.

Selection Cutting and Water Yield

Experimental cuttings on two central Arizona watersheds have shown that selection cutting produces little increase in the average streamflow. On a watershed where 35 percent of the basal area of trees was removed, the average streamflow increase was only 4 percent. On a 240-acre companion watershed, the average streamflow was 55 percent greater even 5 years after one-third of the watershed had been converted to perennial grass from moist-site and riparian vegetation (alder, maple, white fir, and Douglas-fir). In the West, where forests experience seasonal droughts nearly every year, the roots of the trees remaining from a selection cut easily occupy the root zones of harvested trees and consume the available water. This relationship may not be true in the more humid East, where precipitation is relatively uniform throughout the year.

Deep Soils, Greater Water Yields

A study of lodgepole pine in the eastern Cascades of Washington has further confirmed that vegetation changes on areas of deep soils provide greater opportunity for water yield increases than similar changes on shallow soils. Lodgepole pine growing on soils 2 to 3 feet deep used 2.5 inches of soil moisture during the dry season, while pines on soils 6 feet deep or more used 6.4 inches. Clearcut harvesting of pine on deep soils will greatly reduce transpiration losses and thus maintain a higher level of soil moisture to sustain dry-season streamflow.

Rehabilitating Strip-Mined Lands

A survey of 30 counties in eastern Kentucky is providing a reliable measure of the extent, type, and location of areas disturbed by strip mining operations. Preliminary results reveal that 10,000 acres or 2.3 percent of 434,718 acres surveyed are affected by stripping, and that 99 percent of this stripped area is on forested land. In addition, 122 miles of coal-haul roads averaging 75 feet in width covered a total of 1,100 acres within this area. Many of the spoil banks left by strip mining are difficult to revegetate because of extremely acid conditions and the occurrence of toxic minerals in the soil, aluminum being one of the most troublesome. Problems such as these may be alleviated by mining practices which promote leaching of spoil materials. Also, plants tolerant of relatively high concentrations of aluminum are being sought for rehabilitation plantings. Guides are being developed for the proper placement of spoil materials to lessen the occurrence of toxicity at the surface.

RANGE AND WILDLIFE HABITAT RESEARCH

Deferred Grazing Improves Range

On two units of the Santa Rita Experimental Range in southern Arizona, the allowable stocking was increased 62 percent between 1954 and 1961 by deferring grazing until the end of the summer grazing period every other year and by limiting consumption of perennial grasses to 40 percent of the annual production. This improvement in the range was accomplished without killing mesquite. Where practically all mesquite was killed in 1954 and 1955 on two other units, the allowable stocking increased 169 percent over a 7-year period with the same alternate-year deferment and limitation on grazing. The increased grazing capacities were equivalent to 8 and 17 additional head of cattle per square mile respectively on the mesquite-free units. These results indicate that grazing management alone can improve semi-desert grass-shrub cattle ranges, and that even greater increases in grazing capacity are possible with the application of mesquite control.

A Useful Index to Grass Production

Knowledge of the amount of grass produced per inch of summer rainfall has helped in evaluating the relative productivity of rangelands and in determining production trends. Production of perennial grasses on southern Arizona ranges varies widely from year to year, not only with the condtion of the range but with the amount of rainfall received during the growing season; thus the trend in productivity is generally obscured. For example, grass production changed from 215 pounds per acre in 1954, to 562 pounds in 1958, to 235 pounds in 1962; yet no trend in productivity was indicated. When the same annual production figures are expressed in pounds of grass per acre per inch of summer rainfall (19 pounds in 1954, 37 pounds in 1958, and 43 pounds in 1962) a definite upward trend in productivity is shown. Such information permits the rancher or range administrator to judge range improvement or deterioration regardless of variations in rainfall.

Late Fall Grazing To Control Big Sagebrush

Grazing by sheep in the late fall shows promise as a means of controlling invasion of big sagebrush into stands of crested wheatgrass. On the Benmore Experimental Range in Utah, big sagebrush declined about 20 percent during the second and third year of late fall grazing by sheep; in contrast, it increased more than 50 percent under

early spring grazing by cattle. This practice appears to be effective if grazing begins before brush stands become dense, with no more than three or four sagebrush plants per 100 square feet.

Seed Sources To Restore Game Ranges

Studies are now underway in central Utah to gain knowledge of the herbage production of forage plants for winter game range, with particular emphasis on the productivity of seed from different sources. Plants of fourwing saltbush (*Atriplex canescens*) grown from several seed sources demonstrate some of the variations in productivity. On an irrigated area, plants grown from seeds from the highest yielding source (New Mexico) produced 2.4 times more herbage than those from the lowest yielding source (Nevada). On a nonirrigated area, yields from New Mexico and Nevada sources were nearly equal, and plants from the local seed source (Ephraim, Utah) produced the highest yields. Apparently, the natural variation in such species will allow much progress in the selection of superior strains for particular conditions.

Deer Prefer Sprouts to Seedlings

It is often difficult to harmonize management of deer herds with the regeneration of some timber species; however, recent studies have shown that in the Appalachian Mountains of North Carolina considerable harmony is possible. Three years after heavy selective cutting of hardwoods in an extensive area, it was discovered that deer preferred sprouts growing from old stumps, even though tree seedlings made up 80 percent of the reproduction. Approximately 60 percent of the sprouts were grazed, as compared to 10 percent of the seedlings. Sprout production can be increased by deliberately cutting trees of poor form and noncommercial species. Although deer population is fairly high in the area studied, adequate forest regeneration is apparently assured.

FOREST ECONOMICS AND MARKETING RESEARCH

Timber Management Profitable

Recent studies of farm forestry in the southern Virginia Piedmont show that interplanting of poorly stocked seedling and sapling stands of pine yield a return of about 5 percent on the planting investments. Thinning and release of hardwood poletimber and sawtimber stands produced comparable rates of return.

In red pine plantations in the Lake States, site quality influenced rates of return more than other factors such as initial tree spacing, stand density after thinning, and rotation age. Prospective earnings from plantations on high sites were estimated to average about 5.5 percent.

Commercial thinnings in Douglas-fir stands 50–70 years old in the McCleary Experimental Forest in Washington have yielded annual cash incomes of about $10 per acre while increasing earning rates on the remaining growing stock. Frequent light thinnings were best in the younger stands under 55 years of age. Stands approaching 70 years of age were considered financially mature.

Local Governments Benefit

A nationwide study of National Forest contributions to local governments showed that in 1962 "25 percent fund payments" from National Forest revenues averaged 19 cents per acre. "Contributions in kind" averaged 44 cents per acre for fire control, road construction, and other services for which States or counties would have had to pay in the absence of Federal expenditures. Local taxes levied on private property similar to the National Forests averaged about 43 cents per acre.

A related study in Michigan showed that State and National Forest lands in that State are contributing increasing proportions of the timber harvest—mainly as a result of better forest management, larger sales, and more effective marketing. The decrease in the share of the timber harvest coming from private properties has been effected by increasing urbanization, forest land fragmentation, absentee ownership, and changes in land use objectives.

Sawmill Study Shows Up Losses

Recently completed studies of hardwood sawmilling operations in Missouri, Ohio, and Kentucky disclosed that sample mills averaged a daily loss of $16 from downtime, much of it avoidable, and an additional average loss of $6.40 per thousand board feet due to mismanufacture. Logs were seldom cut to produce the best combination of grades possible, and losses of potential values on some logs were as high as $40 per thousand board feet. Most mill operators did not keep adequate cost records—an omission that contributed to poor cost control of mill operations and inefficiencies in management.

A related study of 17 sample sawmills and concentration yards in the Appalachian region disclosed that losses in value of oak lumber during air-seasoning averaged about $12 per thousand board feet. With a small additional investment in roofing of lumber during drying, and with use of an adequate number of stickers, seasoning losses could be reduced by an estimated $10 per thousand board feet.

More Wood Used in FHA Houses

A study of wood use indicated that in 1962 an average of 10,200 board feet of lumber, 2,200 square feet of plywood, 750 square feet of insulation board, and 500 square feet of hardboard was used in the construction of single-family houses inspected by the Federal Housing Administration. The study also showed that there were fairly large increases in the average per unit use of plywood, insulation board, and hardboard between 1959 and 1962. Part of this was attributable to

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the displacement of lumber by competing materials in such house components as sheathing and subflooring. Despite this displacement, there was a small rise in the use of lumber per unit in this period, primarily because of growth in the average size of units built.

Wooden Highway Posts a Good Buy

A recent study in West Virginia showed that, contrary to common belief, the in-place cost of treated wood guardrail posts averaged more than 10 percent lower than the cost of steel posts now widely used. A new company formed on the basis of the findings of this study is now installing wood guardrail posts in the State. An abundance of suitable wood material is available in the Appalachian area for the production of treated wood posts, yet few of the posts installed along highways during recent years were wooden.

Colorado's Forests Inventoried

The first complete inventory of Colorado's forests revealed a volume of 52.7 billion board feet of sawtimber on 12.3 million acres of commercial forest land. Sawtimber stands occupy slightly more than half of the commercial forest area and younger stands the remainder. Lumber accounts for almost nine-tenths of the primary timber products now being harvested. Forest values from water, recreation, and grazing must be considered as of major importance along with timber in the management of Colorado's forests.

FOREST RECREATION RESEARCH

Visitors Affect Campground Planning

An Oregon study showed that campers should not be considered as one general category with similar interests and requiring standard facilities. Instead, campers tend to become grouped under specific activity interests, such as for fishing, nature study, swimming, and water skiing.

Often the requirements of one group are incompatible with those of another. Unplanned or forced intrusion of one activity on another can alter the complexion of use, demands on the site, and user satisfaction. The nature study enthusiast usually wants wide spacing and tranquility. The water skiers seem to like lots of nearby company in their camp, and among their main interests is the adequacy of the boat launching ramps. Swimmers or fishing groups, on the other hand, think that the noisy, large boats and water skiing should be prohibited because they can no longer enjoy the fishing, swimming, and quiet that once prevailed.

Zoning water areas, or separating uses in space and time, is only a partial solution. The campground's location and layout must also be considered. The study suggests designing campgrounds to meet specialized needs, publicizing this, and meeting the various needs of the public by allocating the different campground types on a regional basis as needed.

Opportunities in Private Campgrounds

A study in New Hampshire produced new information regarding the reasons for success or failure of newly established private outdoor recreation enterprises. In that State the number of privately owned campgrounds had increased from 12 to 108 during the past 10 years. This development stems partly from the inadequacy of public areas to meet the demand; however, many owners apparently went into business because of the romanticism associated with outdoor recreation as well as the profit motive.

Less than one-fourth of the owners had sought the services of a private or public planning consultant to evaluate the market, or to obtain information on campground layout, development cost, expenses, and potential income. Even fewer had obtained published material to guide them in their campground planning.

On the bright side, the study showed that there is good opportunity for well-located, well-managed campgrounds with adequate facilities and services. These are provided most successfully by a person (1) who recognizes that campers are becoming more discriminating in their requirements, and (2) who takes an active interest in his clientele and is alert to their differences and needs. A market for this sort of service indeed exists. In fact, the campers who used the privately operated campgrounds preferred them over public campgrounds two to one. They based their preference on such features as advance reservations, more conveniences such as hot showers and electricity, entertainment, and a variety of recreation facilities such as horseshoes, volleyball and softball, and even baby sitting services.

Campground Vegetation Studied

A Pennsylvania campground study showed much less vegetative cover and a decline in the number of plant species at the close of the camping season. This is what one would expect; however, the losses were not steady. Campsites that averaged one camper per day over the 100-day summer season averaged only 10 percent loss of cover. When use averaged two campers per day, ground cover loss soared to 60 percent. Several plants, such as wild strawberry, violets, and mosses, disappeared after very little use. Pathrush and Canada bluegrass, however, may have the resistant, compaction-tolerant attributes needed to maintain cover. These plants withstood heavy use remarkably well and invaded areas formerly occupied by less tolerant plants.

Arizona and Utah studies indicated that quaking aspen (*Populus tremuloides*) may be one of the better campground species. In areas of heavy camper use, many conifers disappeared, but aspen increased. Furthermore, aspen responded favorably to fertilization and irrigation. Treated trees were more vigorous and their growth rates were increased 17 to 36 percent over the untreated control trees.

In southern Michigan, a circular slide rule was developed to estimate the tolerance and durability of understory vegetation in recreation sites. Using as factors the percent of low-growing vegetation (grasses and shrubs), percent of shade, and weight of low-growing vegetation in the absence of trampling, the slide rule provides an estimated weight of low-growing vegetation that will survive trampling.

FOREST FIRE RESEARCH

Fire Research Results in Action

For several years the Forest Fire Laboratories have been reporting their findings on new fire retardant chemicals. Now these formulations are in practical use, providing safer, cheaper, and more effective fire control. Recent studies have provided field guides for determining the conditions under which low-cost materials can be effectively applied from the air, and for identifying the conditions requiring a more expensive, long-term retardant.

Chemicals are also finding increased use in ground applications. Safer use of fire in logging slash disposal has been made possible by treating problem fuels with waterproof coatings and fire accelerants as well as fire retardants. This allows foresters to get slash burned under conditions which were formerly too wet for effective burning or too dry for safety.

Fire Prevention Studies

Social scientists studying forest fire prevention have developed several leads for immediate use in improved prevention programs. A series of new fire prevention signs, modeled after the European traffic control displays, proved twice as effective when compared with the commonly used roadside fire prevention signs.

A special study in the State of Maine shows that 85 percent of Maine's forest fires are caused by residents in the immediate locality and that nearly one quarter are started by children under 12. Such statistical studies in depth are needed in all areas to pinpoint the direction of needed local prevention effort.

Another study has given a conclusive answer to a question that has long bothered foresters: Will bottles and cans left in the woods start fires? Yes, bright sun shining at a critical angle through a jug filled with water or other clear liquid is focused on a small spot and can immediately ignite decayed wood and some other fuels. The same thing may happen if the sun strikes the concave bottom of a pressurized dispenser can at a critical angle. The answer to this one is clear. Do not leave such items near flammable fuels if they will ever be exposed to the sun.

California's fuel-break research program, aimed at preventing conflagration fires, has been plagued with the problem of how to kill scrub oak, a particularly worthless and flammable species. This tree has stubbornly resisted chemicals that are toxic to most other plants. This year, 2 ounces of a partially soluble soil sterilant applied in a ring around sprouting root crowns has accomplished the job. Not so successful was the continuing search for fire resistant species to plant on fuel breaks. Three of the eight species tested proved irresistible to rabbits. Mediterranean saltbush, considered particularly promising, disappeared completely within 3 weeks after planting.

Laboratory Studies Continue Fruitful

Because applied studies are moving ahead so rapidly, the fundamental laboratory investigations which support them must also be pressed. Without a constant flow of new knowledge it is extremely difficult to improve on conventional fire control methods. In 1965, several advances were made in better understanding the basic mechanisms of fire.

Wind tunnel tests have been used to investigate the mechaniscs of wind-driven fires. It was found that, even for low windspeeds, the lower layers of the flame front were nearly horizontal and that the horizontal velocity of the hot gases was greater than the speed of the ambient wind. This horizontal jet of flame appears to be one of the major processes controlling the spread of wind-driven fires.

Studies of fuel physics and chemistry are showing how ignition takes place in forest fuels at specified moisture contents. Results indicate a spontaneous ignition temperature of 425° C. in Ponderosa pine needles with a 7-percent moisture content. At the same moisture content, ignition in the presence of a pilot flame occurs with temperatures as low as 270° C.

Additional fuels research in Alaska has found that forests containing a large amount of lichens and mosses are extremely susceptible to fire regardless of rainfall. Lichen-moss fuels are extremely fast in reacting to changes in atmospheric humidity, and they will burn well whenever humidity drops below 40 percent, regardless of the amount and frequency of rainfall.

At the opposite climatic extreme, research in Arizona has demonstrated that the oil content of chaparral changes apreciably with the moisture content of the foliage. This work has practical implications in predicting chaparral flammability, and further investigations are planned.

FOREST INSECT RESEARCH

Better Forest Spraying

A chemical insecticide evaluation project, activated in 1964 at Berkeley, Calif., produced significant advances in several areas. Fifty-three chemicals were screened in the laboratory against the spruce budworm and several other important forest insects. Two of these Zectran and Dibrom, were tested against the spruce budworm in field tests in Montana. Zectran appears promising as

a substitute for DDT for control of the budworm. Further tests will be made. (See Caution on p. 30.)

Finding exactly where the spray goes has been a problem ever since forest aerial spray techniques were first developed. When individual spray droplets land on foliage, insects, or other objects, the carrier soon evaporates or soaks in and the spray may become impossible to detect readily. Several methods have been used in the past to track spray droplets, but none has been consistently satisfactory. The Berkeley laboratory has successfully tested a new approach using small (3 to 7 micron) fluorescent particles suspended in spray applied by aircraft. The particles are small enough so that several are included in even the smallest spray droplets. They adhere strongly to the objects on which the droplets land, and are detectable with an ultraviolet light source for weeks, or possibly even months after spraying. Furthermore, their numbers are proportional to the size of the droplets. Droplet size is a highly critical factor in the performance of aerial sprays, and a rapid evaluation is afforded by this new technique.

The Ecological Approach

Recent events have emphasized the need for a broad look at our approaches to insect control. For example, some highly effective chemicals have undesirable side effects. Other materials are no longer effective in some cases where insects develop resistance; signs of this have already been detected in the spruce budworm in Canada.

Integrated control—the use of both chemical and biological agents in a single unified control program—is an approach that may be applicable to a number of problems. To support this approach, research scientists are obtaining detailed knowledge of several insect pests and their ecological relationships. In the Pacific Northwest, research has shown that the hemlock looper's most important parasites attack during the later larval stages. Thus, insecticides may be applied most effectively during the early period of larval development without undue harm to the parasites that help to control looper populations.

A similar approach has been taken with the lodgepole needleminer in California. Here spray timing was adjusted to favor an important parasite. Control effectiveness resulting from the application of the insecticide remained the same; impact on the parasites was reduced. Concurrent studies showed that spraying did little to adversely affect the needleminer's parasite complex in general.

Other Control Methods

New techniques using other than conventional chemical and biological methods are commanding increased attention. Sterilization has produced good results with several species of insects. In tests on forest insects, Forest Service researchers in the Central States have reduced locust borer reproduction 99 percent in the laboratory using a chemosterilant; field tests are now underway. In the Northeast, similar laboratory success has been achieved with the gypsy moth; in this instance, male moths were sterilized with radiation from a cobalt-60 source. Field tests showed that the sterilized males were not fully competitive with the normal males, however, and refinements are underway to overcome this difficulty.

Attraction is also undergoing increased study as a tool in insect surveys and control. Although over 200 species of insects have been shown to possess an attractant or excitant, the attractants themselves have been identified chemically in fewer than a dozen species. With Forest Service support, workers at the University of California and Stanford Research Institute are attempting to isolate and identify the attractant substance associated with *Ips confusus*, a destructive bark beetle. Progress has been rapid, and a clear-cut analysis of the complex material appears imminent. Another study showed the presence of a powerful sex lure in the carpenterworm, a pest of valuable southern hardwoods. Marked male moths were attracted by virgin females at distances up to 1 mile, and at one-half and three-quarters of a mile, 20 percent of the marked insects were recovered.

Mass production of insects is a requisite for research on attraction and sterilization, and for large-scale chemical screening programs. Development of artificial diets has enabled Forest Service researchers to raise large masses of the spruce budworm and the Douglas-fir tussock moth. Artificial diets for other serious forest pests are under intensive investigation.

FOREST DISEASE RESEARCH

Trees, Rusts, and Rabbits

Plant serology, a technique involving antigen-antibody responses in rabbits, has been utilized successfully to determine the relationship between three closely related species of rust fungi which attack trees. Spores of *Cronartium ribicola*, *C. cerebrum*, and *C. fusiforme* were injected into the test rabbits and the antisera compared. Each rust could be identified and related to the others on the basis of these tests. This demonstrates that the method can be used to distinguish between spores of different species of rust fungi. Also, it is possible that smaller differences can be detected, so that races or pathogenic strains may be revealed in subsequent studies.

This work ties in directly with programs for breeding disease-resistant trees. It enables the breeder to identify precisely the fungus he is using to screen genetic material. Without this knowledge, results would vary greatly from year to year.

Inside Lighting for Fungi Study

In another technique spores of pathogenic fungi are treated with a fluorescent brightener and examined under a fluorescence microscope. The

brightener causes no noticeable changes in germination, yet critical observations of structure and germ tube contents are possible by means of this "inside lighting." The method is successfully used in white pine blister rust investigations conducted in cooperation with the University of Wisconsin. Spore deposits on needles are located easily for sectioning and individual spores and infecting germ tubes are easily seen on the needle cross sections.

Biological Control of Diseases

The Forest Service has recently expanded its program for the control of tree diseases by means of parasitic, antagonistic, or predaceous organisms. Typical of this research is the progress in the use of fungus to control three common tree diseases.

Four new studies have been started on the purple mold fungus, *Tubercubina maxima*, on white pine blister rust. The mold is parasitic on blister rust, and is being studied to determine its effectiveness in controlling the disease on western white pine in the northern Rocky Mountains.

A brown mold, *Gonatorhodiella highlei*, is being studied in connection with its effect on a species of the fungus *Nectria*, which in association with a scale insect destroys large numbers of American beech in the Northeast. The parasitic brown mold can kill the fungus, but is not aggressive enough to prevent its spread to other trees. Ecological studies have shown the mode of parasitism, and also that a minute beetle is responsible for much of the short-distance spread of the fungal parasite.

A harmless fungus, *Peniophora gigantea*, has been found to stop and actually replace the pathogen, *Fomes annosus*, in the roots of naturally infected stumps of slash pine. Methods are being sought to encourage the buildup and spread of this and other organisms that are antagonistic to the destructive root pathogen.

Sooty Bark of Maple

The fungus *Cryptostroma corticale* is known as the probable cause of sooty bark disease of maple. It also creates problems in the wood-using industries, especially papermills, where it is a human allergen producing effects described as severe bronchial asthma. Sugar maple harvested in the Lake States regions is used primarily for lumber, veneer, and pulpwood. Difficulties with the fungus as an allergen have occurred only when logs or bolts have been in storage for long periods prior to manufacture. Sporulation is practically nonexistent in mills that pulp their wood soon after trees are cut. Scheduling of wood use before sporulation appears to offer the best possibility of control. Research is underway to obtain life-cycle information on which to base scheduling recommendations.

Metabolism of Fusiform Rust

Germination of fungus spores and their initial penetration into host tissue is generally through production of a germ tube with nutrient reserves serving as a source of energy. Research has shown that some spores appear to contain limited reserves and their germination is significantly increased by the addition of nutrients in water. Germination of stored spores of *Cronartium fusiforme* is higher in the presence of either glutamine or oleic acid. Knowledge of nutrient deficiencies and how to overcome them is basic to improving resistance and could also provide leads for developing safer, more effective controls.

FOREST PRODUCTS UTILIZATION RESEARCH

New Tree Evaluation for Douglas-Fir

The Forest Service has developed a new tree grading system for Douglas-fir, which is based on three simple measurements on the easily visible 16-foot butt section of the tree and a determination of merchantable height of the tree. This should be a significant improvement over the present method of measuring timber quality, which is in the form of log grades applied to cut logs or to log lengths in standing trees. While the traditional method requires considerable judgment to accurately grade upper log lengths in tall trees and dense stands, the new method practically eliminates judgment considerations, is easier to apply, and requires less time to evaluate each tree. Thus, the new system will provide more uniform results in quality cruising.

The system is unique in that trees are not placed in distinct classes or grades; rather, there may be an infinite number of grades, since the system uses a simple equation to predict individual tree value (dollars per thousand board feet) for standard lumber production. In a sample application to 1,000 trees in four States, the system predicted tree value of standing trees as accurately as the most accurate log grading system available. In addition to economy and simplicity, the system requires a minimum of training, and should appeal to both public and private foresters of the West who have expressed the need for such an evaluation system.

Polysulfide Pulping

The new polysulfide pulping process developed at the Forest Service's Forest Products Laboratory (FPL) promises yields of pulp up to one-fourth greater from a given amount of wood than is obtained by conventional kraft pulping. This could mean an annual increase in kraft-type pulp production worth $350 million at current prices.

The polysulfide process is closer to commercial realization with the discovery at the FPL of an efficient process for the recovery of reusable chemical from the sulfur-enriched spent liquors. Not only does this recovery system save money in the pulping operation, but it serves to reduce air and water pollution through the capture and use of effluents and gases.

The recovery process has worked well in laboratory experiments and now needs to be tested under

pilot-scale and full commercial evaluation in cooperation with industry. It provides for the recapture of hydrogen sulfide generated during the cooking of the pulp, and for the reconversion of the spent liquor to sodium sulfide. The lime kiln and causticizing system required in conventional kraft pulping will not be needed, and the elimination of these elements may well offset the capital cost of the additional recovery-system apparatus. Commercial trials of the process may establish that only a single-step furnace operation is needed to convert the dehydrated black liquor to sodium sulfide.

Stressed-Skin Design Still Going Strong

An experimental two-story house built in 1938 at the Forest Products Laboratory underwent a final series of experiments to evaluate its condition before it was dismantled this year. This was one of two houses built of the then-revolutionary stressed-skin panel construction. The second house, a one-story structure, will be retained for further testing.

The two houses are prototypes of a system of construction developed by FPL research engineers and since then widely adopted by the manufactured house industry. The unit panels are 4 by 8 or more feet in size, and vary in thickness depending on their use in floors, walls, or roofs. They consist of plywood sheets nail-glued to light lumber framework. Their design is basically that of a box beam, and accordingly they can be built to carry predetermined loads, thus representing a marked advantage in house design.

The two-story house was subjected to a unique method of full-scale loading to determine its resistance to wind. An arrangement of wood beams across its facade permitted the application of forces simulating winds up to 125 miles per hour—a full hurricane—by means of hydraulic winches. There was virtually no racking of the walls at right angles to the facade, nor was the structure noticeably raised from its foundation. The structural rigidity of the building after 26 years of continuous use was thus conclusively demonstrated—attesting to the adequacy of the design concept.

New Planing System for Lumber

Research at the Forest Products Laboratory has developed a new device for planing softwood dimension lumber which produces flakes much more suitable for use in particle board and pulp than conventional planer shavings. Particle boards made from the new-type flakes were up to 50 percent stronger and dimensionally more stable.

Key to the new concept is a disk or ring planer head with cutting knives fixed to its faces. It thus cuts across a face or edge of the stock being planed, rather than along the length. Flakes produced are quite uniform in length and thickness, rather than haphazard in shape and curled. The cutter does not produce as smooth a surface as a conventional planer head, but highly acceptable surfaces can be obtained with a second cutter that has an abrasive action producing fine particles with excellent potential for boards and molded products.

An estimated 10 million tons of planer shavings are produced yearly in western dimension mills alone, and they are mainly consigned to power generation or scrap burners. Their poor shape is chiefly responsible for their low value, about $3 a ton, for pulp or particle board.

The uniform flakelike shavings produced with the new cutterhead are estimated to be worth $6 a ton for pulp or at least $15 a ton for particle board. The fine, hairlike fibers removed by abrasive cutting in the second step of the new planing method would probably be worth up to $15 a ton. If only one-half of the western shavings can be upgraded in value from $3 to $10 per ton, the annual economic gain would amount to $35 million.

Wood Density Surveys Provide Basic Data

The Forest Service has completed a survey of wood density in standing timber for the 11 Western States, a major segment of its survey of wood density. Results of this research were detailed in a preliminary report circulated to interested industrial, governmental, and educational groups. A companion report containing the basic data for the southern pine region was also completed and circulated.

These two reports provide the most complete information to be found anywhere on the specific gravity of major commercial softwood species in the United States. The well-known relationship of specific gravity to strength, fiber content, and related properties makes these data useful to lumber, plywood, pulpwood, and other forest-based industries.

The preliminary report on the western density survey gives detailed findings on one hardwood and eight softwood species, which were rated as priority species by cooperating industry groups. While, in general, the specific gravity determinations confirm values previously published by the Forest Service, the study threw much new light on long-standing silvicultural and utilization problems. For example, the specific gravity of Douglas-fir was consistently lower in the four-State area of Colorado, Utah, Arizona, and New Mexico than throughout the rest of the Western States; even so, the mean value of 0.43 was considerably higher than the previously published average of 0.40. Likewise, in the area east of the Cascades in Oregon, Washington, Montana, Wyoming and Idaho, the survey mean of 0.45 was appreciably higher than the earlier published average of 0.41.

The most significant differences between the new survey data and older published values, however, were increases found for western hemlock, Pacific silver fir, and white and noble fir. The new data for western larch showed an appreciable decrease with a mean of 0.48 against a previously published average of 0.51.

The data, coupled with strength analyses based on them, will find immediate industry application in the determination of new design stress ratings for use in construction with lumber, plywood, laminated structural members, and poles and piling. The American Society for Testing and Materials is now developing these ratings.

Specific gravity data for the four major southern pine species was released in a summary status report for seven Southern States. Mean tree specific gravities were presented for each species by diameter classes. The report substantiated certain geographic trends in density variation that had been reported previously, but did not confirm the theory that product standards could be based on geographic boundaries. Although data is not yet complete for the entire southern pine area, the results have already had wide application by pulpwood buyers, manufacturers of southern pine plywood, and southern pine lumber manufacturers.

Warp Reduced in Southern Pine

Experiments at FPL demonstrated that improved sawing methods can substantially reduce the amount of warp in 2 by 4 studs cut from loblolly pine logs.

The improved sawing method proved to be 47 percent better than the conventional method of sawing in the South in production of No. 1 and better grade studs from butt logs. Key to the improved method of sawing is the positioning of the logs so that the weak pith wood is confined to a single wedge-shaped piece from the central area of the log, which is discarded as residue. Pith wood shrinks and swells longitudinally much more than normal wood, hence studs warp out of shape if these two types of wood are present in unbalanced proportions.

In upper logs, the problem of warp was found to be much less severe, but the improved method produced 7 percent more No. 1 studs than the conventional method. Studs produced by the improved method also averaged 10 percent higher in stress rating than conventionally sawn studs. Since the improved method produces more top stress grade studs and fewer rejects, it would probably increase total production of top-grade studs by about 20 percent.

In terms of southern pine lumber prices (f.o.b. mill), lumber produced from butt logs by the improved method was worth about $10.50 more per thousand board feet than that produced by the conventional method. On a daily production of 40,000 to 100,000 board feet this would mean an additional daily profit potential of $50 to $500, depending on the mix of butt logs and upper logs being sawed.

FOREST ENGINEERING RESEARCH

Single Tire Reduces Road Costs

A recently completed study on the effect on roads of the new wide single truck tires has pointed the way toward savings of between $750 and $1,000 per mile in construction of ballasted-type logging roads where full-scale use of the new tires can be planned. Since many thousands of miles of such roads are built annually (2,000 miles in one Forest Service Region alone) the potential savings could be significant.

Aerial Logging Systems

Substantial progress has been made in developing and improving aerial logging systems. These reduce road requirements, protect soil and water values, improve the esthetic appearance of the logged areas, and permit logging of difficult access areas. Design and operating criteria, heretofore lacking, are being developed to insure economical and safe balloon and skyline logging systems. Simplified design procedures have been developed to permit logging engineers to design and lay out more economical and safer skyline systems.

INTERNATIONAL FORESTRY

In 1965 the Foreign Forestry Services unit in the central office was renamed the International Forestry Staff. However, Forest Service activities in the international field remain essentially the same as before. They include (1) the training of foreign nationals, (2) technical assistance to foreign governments, (3) participation in the affairs of appropriate international organizations, and (4) the translation into English of important scientific documents on forestry and related fields.

Training Foreign Nationals

During calendar year 1965, the Forest Service programed 331 foreign nationals from 51 countries for academic, observational, or on-the-job training in forestry and related fields. Two-hundred-eleven participants were sponsored by the Agency for International Development; 12 by agencies of the United Nations; and 108 by their employers or governments, by foundations, by the U.S. Department of State through its educational and cultural exchange programs, or by the participants themselves. In addition, four employees of the Agency for International Development were given refresher training before returning to overseas assignments.

The training of these pople involved the preparation of 112 individual training programs and 27 group programs. Among the group programs were the Tropical Forestry Short Course at the Institute of Tropical Forestry, Puerto Rico; the Forest Management Short Course; and the Youth Leadership Training Course. Each of these was 12 weeks in length.

Thirty-seven foreign nationals were assigned to U.S. colleges and universities for academic training in forestry and related fields, bringing to 81 the total current academic enrollment of foreign nationals programed by the Forest Service.

Technical Consultation and Support

Activity in all phases of assistance to foreign governments increased during the year. Fifty-seven countries made over 800 requests for assistance. These included (1) advice on technical problems, (2) procurement of seed, (3) supply of publications and training films, and (4) help in the procurement of specialized equipment and supplies requisitioned by foreign governments, especially through Agency for International Development (A.I.D.) forestry advisors.

On October 1, 1965, 57 U.S. foresters were serving in 27 foreign countries on 2-year assignments. Thirty-four of these men were on direct-hire contracts with A.I.D.; the remainder were working on projects under the sponsorship of the Food and Agriculture Organization (FAO) of the United Nations, the United Nations Special Fund (UNSF), universities, and the Departments of Defense and the Interior. In addition, 17 Forest Service employees served on short-term assignments (6 months or less) in 15 countries. Other overseas work included the assignment of a fire research specialist on detail to the Department of Defense in South Vietnam and review of Public Law 480 research projects in several countries in South America.

One significant project was a 2-month regional reconnaissance survey by three Forest Service specialists from the Forest Products Laboratory to appraise the need for a tree identification and wood utilization study in the Amazon Basin in South America. A.I.D. has accepted their recommendations and has approved the funding of a 5-year study in five Latin American countries.

As a gesture of good will, President Johnson gave to the President of Chile a supply of hybrid pine seed to assist in the inauguration of a national reforestation program. The seeds were developed from a cross between *Pinus attenuata* and *P. radiata*, by the Forest Service at the Institute of Forest Genetics, Placerville, Calif.

In October, two Forest Service employees were placed on 2-year assignments in Paraguay and the Dominican Republic under a contractual arrangement that will characterize all future overseas assignments financed by A.I.D. These are Participating Agency Service Agreements, which are contracts financed by A.I.D. and implemented by the Department of Agriculture through the International Agricultural Development Service. Employees of the Forest Service and all other Department of Agriculture employees on overseas assignments will remain members of their agencies, and will receive technical and administrative support and supervision directly from their parent units.

International Organization Activities

The Third Session of the North American Forestry Commission was held in Washington, D.C., in October. Representatives from Canada, Mexico, and the United States met to plan the work of the Commission for the next biennium. The Commission reviewed progress of working groups in forest fire control, forest insects and diseases, forest tree improvement, and wildlife and recreation. Working groups met during the year in Mexico and Canada.

Other important international conferences attended by Forest Service representatives included (1) the meeting in Canada of the Permanent Committee of the International Union of Forest Research Organizations (IUFRO); (2) Section 41 (Forest Products) of IUFRO in Australia; (3) the Organization of American States (OAS) Inter-American Conference on Renewable Natural Resources in Argentina; (4) the UNESCO Symposium on Representative and Experimental Watersheds in Hungary; (5) a preparatory meeting in France of representatives from member countries of the Organization for Economic Cooperation and Development (OECD) on Preservation of Wood and Wood Products; (6) FAO/ECE Timber Committee in Geneva, Switzerland; and (7) the FAO Biennial Conference in Rome, Italy.

Translation Services

Approximately 5,000 pages of scientific and technical publications were translated to English under the Special Foreign Currency Science Program. An additional 700 pages were translated through a service provided by the U.S. Department of Commerce. Publications to be translated were selected by the Forest and Range Experiment Stations and the Forest Products Laboratory. Copies of all translations were distributed to the Stations, the Laboratory, the Institute of Tropical Forestry, and the National Agricultural Library.

FORESTS COVER ONE-THIRD of the land in the continental United States. Over 70 percent of the commercial forests is owned by private citizens. The Forest Service cooperates with State agencies and private forest owners to (a) protect 450 million acres of State and privately owned forests and watersheds against fire, insects, and disease; (b) encourage better forest practices for conservation and profit on the 367 million acres of private forest land; (c) aid in distribution of planting stock for forests and shelterbelts; and (d) stimulate development and management of State, county, and community forests.

Cooperation—State and Private Forestry

James Moore bought a ranch near town and shortly thereafter asked the local Service Forester for advice concerning the timber on his property. The ranch contained considerable mature ponderosa pine in need of harvesting as well as areas with high potential for Christmas tree production. Moore needed immediate income, so the forester marked some of the trees for harvesting on a selective basis. He also instructed Moore on Christmas tree culture and marketing. Before the year was over, the rancher had realized about $8,000 from sales of saw logs and Christmas trees.

Moore is continuing his saw log operations based on a management plan drawn up by the forester after he had inventoried the remainder of the timber on the ranch. While making this inventory, the forester had observed an abundance of deer and elk as well as a number of old houses at various places on the ranch. He suggested that these houses be renovated and rented to hunters. Moore is now getting started on this income-producing project. He expects to furnish housing, horses, and hunting rights to about 20 hunters at a time at a daily fee of $20 each.

This is an example of how the Federal-State Cooperative Forestry Program helps the private woodland owner. The Forest Service, the States, and private owners, operators, and primary processors work together to apply better forest management and protection to the Nation's forest resources. The Service Forester, employed by the State, is partially paid by the Federal Government. The aims of such cooperation are to grow and manage forests that are healthier, more productive, more usable, better protected, and more profitable, particularly to small woodland owners and to rural communities whose economies are largely based on forest resources.

FORESTS AND THE RURAL COMMUNITY

Rural Areas Development

More rural communities are looking to forests and forest resources to supplement or bolster their economies. In this they are encouraged by the Forest Service, which works with State Foresters, industries, landowners, and others to promote better woodland management and more economic opportunities. One of the objectives in improving the rural economy is to increase the number of available jobs so that people will not be forced to move elsewhere to seek a living. In many communities, small wood processing and manufacturing plants and other forest industries are playing an important role in achieving this objective.

Forest Service and State forestry representatives serve on all Technical Action Panels in all States and furnish forestry information and assistance to Rural Areas Development Committees. In addition, the Forest Service furnishes the Economic Development Administration with advice on recreation development loans, the establishment of forest industries, and technical assistance grants in the field of forestry. During 1965 the Forest Service reviewed and reported on 126 rural development programs and projects; provided forestry assistance to 335 Rural Areas Development Committees, Technical Action Panels, and forestry cooperative advisory groups; and serviced 179 special departmental forestry loan, study, training, and development projects.

Neighborhood Youth Corps

The Forest Service worked in close liaison with the Department of Labor, State Foresters, and other responsible officials in the development of State forestry projects performed by the Neighborhood Youth Corps, a part of the President's Economic Opportunity Program. Some 5,500 youths in 29 States and Puerto Rico gained valuable work experience, training, and economic benefits through productive conservation work on State lands near their home towns. They worked on road and trail construction, campground maintenance and development, fencing, timber stand improvement, and other jobs. Girls also participated in the program, doing clerical work in State offices and on occasion helping in food preparation at fire camps. The program received strong community support and enabled many young people to continue their education.

FOREST PEST CONTROL

Insect Control

Bark beetle suppression again required the largest share of insect control effort. Nationwide, nearly 1.1 million infested trees, cull logs, and stumps were logged, cut, piled and burned, or chemically treated to check tree killing. The extensive epidemic in the Black Hills of South Dakota and Wyoming was checked; only maintenance work remained.

Except for the Targhee and Teton National Forests in Idaho and Wyoming, and parts of the South and Southwest, bark beetle populations were kept at endemic levels. Good progress was made toward stopping the outbreak on the Teton National Forest, but additional work will be required in 1966. On the Targhee National Forest, a widespread and especially virulent outbreak intensified. This outbreak has already killed 13 million board feet of lodgepole pine and threatens an additional 35 million board feet, besides stands in Yellowstone National Park. A large control program was started in 1965 and will be continued until the epidemic is controlled.

The area sprayed by aircraft to suppress defoliating insects was much less than the average for the last several years. This was because spraying of approximately 1 million acres of spruce budworm-infested area was withheld pending further development of new insecticides. Thus, control of spruce budworm in fiscal year 1965 was limited to completing the Idaho and Montana projects covering some 680,000 acres, and to low-volume application of malathion by both airplanes and helicopters on 13,000 acres in Idaho and Montana.

Other defoliating insects requiring suppression were Douglas-fir tussock moths, fall cankerworms, and Great Basin tent caterpillars. Virulent infestations of Douglas-fir tussock moth broke out in fir stands in Idaho, Oregon, and California. To suppress them, a total of 241,000 acres was successfully sprayed with DDT—120,000 acres in Idaho, 65,000 acres in Oregon, and 56,000 acres in California. In Pennsylvania, an outbreak of fall cankerworm on 100,000 acres of valuable hardwoods was also successfully sprayed with DDT. A Great Basin tent caterpillar outbreak occurred in Arizona on 22,700 acres of Forest Service, National Park Service, and Indian lands. Suppression was achieved by a jointly sponsored aerial spraying project.

Caution: Anyone using insecticides must exercise care, and observe the directions and precautions on the container label. If insecticides are handled or applied improperly, or if unused portions are disposed of improperly, they may be injurious to humans, domestic animals, desirable plants, honeybees and other pollinating insects, fish, and wildlife. Also they may contaminate water supplies.

Biological control of the larch casebearer was expanded in Idaho. This defoliating insect has spread rapidly in Idaho and Montana since its discovery in 1957 near St. Maries, Idaho. Following investigations of biological control in 1960–63, large numbers of parasitic wasps, reared from casebearer-infested twigs collected in Vermont, were liberated in several infested larch stands in Idaho. The parasites have become established and, when strong colonies are available, they will be collected and distributed elsewhere in infested areas.

Disease Control

Control of the white pine blister rust disease constituted the major portion of the disease control program. Nationwide, 2.9 million acres were covered by systematic sampling surveys to determine the status of the disease, the need for control work, and where and how it should be done. Control work included treatment with antibiotic fungicides on 96,000 acres of infected western white pine stands in Idaho, and removal of 9.4 million gooseberry and currant plants (the alternate hosts of the disease) from 188,000 acres in other parts of the country. Most of this control work was in the West where maintenance control is yet to be established on 74 percent of the 2.9 million acres selected for protection. In the East and Lake States, the control program is more advanced. About 90 percent of the 19.2 million acres under protection are is a maintenance control status.

Control of dwarfmistletoe continued, mostly in connection with timber harvesting and timber stand improvement work. To properly plan and accomplish such control, approximately 523,000 acres were surveyed. In addition, infected trees on 15,500 acres were cut or pruned to remove infection from young stands of ponderosa pine.

Federal-State cooperative oak wilt suppression and survey programs were carried on in Pennsyl-

vania, Virginia, and West Virginia. In Kentucky, North Carolina, Mississippi, Texas, Arkansas, and Oklahoma, oak wilt control was confined to detection surveys only. In total, over 47 million acres were surveyed from the air and about 8,000 infected trees destroyed to prevent further spread.

Other Control Activities

Encouraging progress toward finding and using nonpersistent insecticides was made by the Forest Service's Insecticide Evaluation Unit at Berkeley, Calif. Several found by laboratory tests to be substitutes for DDT were field-tested to determine their efficiency against the spruce budworm and their effects on the environment when so used.

An intensive monitoring program was carried on in connection with all suppression projects where DDT or other insecticides were aerially applied. This was done to provide (1) short-term information on residue levels in big game, fish, aquatic insects, water, range cattle, and forage; and (2) basic information for long-term studies to determine insecticide levels and persistence in an aquatic environment, and movement of the chemical and its metabolites from forest litter through soil particles.

The Federal-State cooperative insect and disease control programs on non-Federal land continued to expand. Seven more States have entered into cooperative agreements with the Forest Service to share costs of surveys and control, bringing to 19 the number of States in the program.

FLOOD PREVENTION AND RIVER BASIN PROGRAMS

The Forest Service carries out flood prevention and watershed protection activities under several programs: the Flood Control Act of 1944, pilot watershed projects authorized in 1954, and the Small Watershed Program under Public Law 83–566, as amended. In assisting with, planning, or carrying out forestry measures under these programs, the Forest Service cooperates with local project sponsors, the Soil Conservation Service, State Foresters, and other Federal, State, and local agencies. It acts directly to apply emergency flood prevention measures on non-Federal and National Forest land, and also cooperates with other Federal agencies and State governments in making comprehensive river basin studies for the development of water and related land resources.

Flood Prevention Projects

Work continued on the forestry and fire control aspects of seven flood prevention projects authorized under the Flood Control Act of 1944. During the year, 34.1 million trees were planted on eroding flood source lands. This planting, 96 percent of which was on the Yazoo-Little Tallahatchie projects in Mississippi, was done through the combined efforts of the Forest Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Corps of Engineers, local soil and water conservation districts, and landowners.

Technical forestry assistance was given to 4,800 landowners and operators in correcting undesirable watershed conditions on private land. This action led to improved forest management on 77,000 acres and the stabilization of 13.4 miles of sediment-producing roads.

Fire prevention and control was strengthened on 2,871,000 acres of private and National Forest lands within the project areas by the construction of 48 miles of fire control roads, trails, and firebreaks and three additional buildings for fire crews and equipment. Other flood control measures included the stabilization of 388 miles of skid trail and logging roads, and the construction of 37 channel barriers to stabilize stream channels and adjacent slopes on the Los Angeles River Project in California.

Pilot Projects

Forestry work in the Watershed Demonstration or Pilot Program on 58 small watersheds authorized in 1953 is completed except for the evaluation of the upper Hondo watershed in New Mexico. Twenty-one landowners received technical forestry assistance in 1965; trees were planted on 132 acres and improved forest management practices were applied on 1,390 acres.

Public Law 566 Projects

Watershed protection and flood prevention projects are started under the Watershed Protection and Flood Prevention program of 1954 (P.L. 566) by local groups which receive planning, technical, and installation assistance from Federal and State agencies under the general leadership of the Soil Conservation Service.

During 1965 the Forest Service worked with State Foresters, the Soil Conservation Service, and local sponsors in planning watershed protection and flood prevention improvements on 109 small watersheds. Work plans were approved and installations authorized on 66 new projects; 48 of these include accelerated programs for improvement of forest lands.

Forestry measures were installed on 198 projects. More than 11 million trees were planted on 10,100 acres of privately owned land. Technical forestry assistance for watershed improvement was given to 2,690 landowners involving 134,800 acres, and protection from forest fire was extended or strengthened on 410,400 acres. Other watershed improvements included hydrologic stand improvement and protection from grazing damage on 80,500 acres.

Public Law 566 improvements on National Forest lands included revegetation on 354 acres by grass seeding and tree planting; stabilization of 5 miles of eroding gullies; and erosion control measures on 14 miles of roadside.

Emergency Flood Prevention

Emergency watershed treatments were applied on seven burned-over areas within and adjoining National Forest lands in southern California. The purpose was to minimize downstream hazards to life and property from floodwater and debris flows which can occur as a result of the destruction of vegetative cover on the watersheds.

Included in this treatment was airplane and helicopter seeding of 96,610 acres to quick-growing grass to provide a protective cover over most of the burned areas. Eight small channel debris and erosion structures were also constructed and 50 miles of emergency fire control roads and trails were stabilized to reduce flood sediment and debris loads. The Soil Conservation Service, State, counties, landowners, and private organizations cooperated in these efforts.

River Basin Surveys

The Forest Service cooperated with the Soil Conservation Service, the Economic Research Service, and State agencies concerned in continuing studies of water and related land resources in many river basins throughout the country. These studies included cooperative surveys with the Corps of Engineers and the Bureau of Reclamation in 19 river basins and with State water resource agencies in water resource inventories and problem analyses of 13 river basins in 11 States.

COOPERATION IN FOREST MANAGEMENT AND PROCESSING

The Federal Government shares with the States the cost of assisting private woodland owners and processors under the Cooperative Forest Management Act. In fiscal year 1965, the Federal share was $2,730,306 and the States' share $4,109,118. During the year 725 service foresters employed in this program by 49 cooperating States and Puerto Rico helped 99,074 woodland owners to improve their multiple use management practices. This involved 6,164,993 acres, or 2.3 percent of the Nation's acreage of privately owned small forests. Gross returns to the owners of these woodlands from the sale of forest products amounted to $17 million. Nine thousand two hundred small forest products operators and processors of primary forest products also were assisted through the program. Cooperative forest management personnel continued to work closely with Rural Areas Development Committees and their Technical Action Panels.

Multiple Use Management

Through the Cooperative Forest Management program and the General Forestry Assistance program, the Forest Service provides leadership, technical assistance, and training in multiple use forest management on non-Federal lands. In these programs the Forest Service works with State forestry agencies and other public and private conservation agencies.

Multiple use management increases opportunities for many private forest landowners. It enables them to realize income and other benefits from related forest uses and products while waiting for timber to grow.

For some owners the use of their forest resources for outdoor recreation, either for personal enjoyment or for income, offers excellent opportunities. Such use can be compatible and complementary with producing timber and other forest crops. For others, Christmas trees, decorative materials, ornamental plants, seeds, nuts, edible fruits, and other special timber-related crops may provide means for adding to their income.

Guidance and professional assistance in multiple use forest management helps family farmers to make full and profitable use of their resources. The resulting improved income opportunities can provide encouragement and reason for families to remain on the farm to make their living. This, in turn, strengthens the base of the whole future rural economy, and the national economy as well. At the same time, important long-term improvements are made in the forest appearance providing a primary background for natural beauty in rural America.

General Forestry Assistance

Under the General Forestry Assistance (GFA) program, Forest Service personnel provide certain professional forestry services that are not covered by State-Federal cooperative agreements and that the States generally do not provide. These services include forest maangement assistance to public and large private landowners and technical assistance to forest industries. GFA funds also support professional forestry services to other agencies of the Department of Agriculture and other Federal departments. Many USDA programs involving private, State, and county lands and interests relate directly to forestry and require more and more professional forestry services in a variety of disciplines on National, regional, State, and local levels.

In fiscal year 1965, Forest Service personnel under the GFA program provided highly specialized forest inventory, management, harvesting, processing, and marketing advice and training assistance to: (1) Large private and industrial owners and operators involving 443 service calls and 30,500,000 acres of forest lands; (2) States and counties involving 114 service calls and 1,822,000 acres of forest lands; (3) other Federal agencies involving 57 service calls and 18,971,000 acres of forest lands; and (4) consultants, organizations, and development groups involving 176 service calls and 60,000 acres of forest lands.

Forest Service personnel under this program prepared 74 forestry publications and 5 movie and slide series; assisted research, States, and industry on 65 forestry studies and long-range plans; par-

ticipated in 266 forestry workshops and meetings; and assisted RAD Committees, Technical Action Panels, and forestry cooperative groups.

Utilization and Marketing Services

Started on its course was a major shift in responsibility for putting to work research findings in the utilization and marketing of forest products. Forest Service research personnel will gradually phase out the servicing of forest products processing plants, except in special cases. The State and Private Forestry arm will intensify its activities in this field. This shift in responsibility coincides with the recognition of a need for greatly increased services, especially to loggers and processors. The transition made available 26 Federal employees and 34 State employees for work in utilization and marketing as of June 30, 1965.

Training of both State and Federal employees who are to engage in this work is a major project, but a good start was made. Two regional training sessions of 1-week duration each were attended by 67 people. A contract for a 6-week wood technology training course was made with North Carolina State University. A total of 30, about evenly divided between Federal and State U & M employees, took this course July 12 through August 20, 1965.

An intensive study of future training needs was also begun through contracts with three consultants with different backgrounds—forestry college staff, Forest Service and industry, and forest industry. The State-employed service foresters will continue and intensify utilization and marketing service to loggers and primary processors through the Cooperative Forest Management program. Training programs are being designed to strengthen this phase of their work.

Tree Planting

Forest and windbarrier planting on State and privately owned land, under authority of section 4 of the Clarke-McNary Act of 1924, continued at about the level of the past few years. Two hundred and twenty-eight non-Federal and private nurseries produced 770,448,000 seedlings and transplants that provided stock for planting about 1 million acres. In addition, 198,758 acres in 25 States were seeded directly. The 98 State-owned nurseries produced 72 percent of the planting stock, 26 forest industry nurseries provided 20 percent, and 105 commercial and other small public nurseries were responsible for the remaining 8 percent.

Most of the planting on privately owned land was in 17 States as shown in the tabulation.

Windbarrier plantings, mainly in the Great Plains States, were made on 40,458 acres, of which 36,769 acres were privately owned land. This is about the same extent of planting as in the previous year.

Seventeen Federally owned nurseries produced over 123 million small trees for reforestation work on Federal lands (National Forests, Bureau of Land Management, Corps of Engineers, TVA, etc.). This stock was planted on 150,000 acres. Also, 55,048 acres of Federal land were direct seeded.

ACRES PLANTED ON PRIVATELY OWNED LAND, FISCAL YEAR 1965

State	Industry owned	Other privately owned	Total
Florida	100, 265	23, 609	123, 874
Georgia	70, 895	29, 078	99, 973
Virginia	42, 678	28, 388	71, 066
Mississippi	28, 705	37, 981	66, 686
Alabama	44, 987	18, 809	63, 796
Washington	36, 040	23, 909	59, 949
South Carolina	26, 216	26, 367	52, 583
Louisiana	39, 675	7, 048	46, 723
North Carolina	20, 551	18, 547	39, 098
Pennsylvania	18, 634	17, 782	36, 416
Oregon	31, 629	4, 648	36, 277
Michigan	732	26, 573	27, 305
Wisconsin	4, 500	18, 035	22, 535
Arkansas	11, 735	7, 561	19, 296
Tennessee	2, 722	14, 643	17, 365
Ohio	9, 128	7, 108	16, 236
Kentucky	5, 648	10, 546	16, 194
	494, 740	320, 632	815, 372

Forest Service assistance to States for tree planting and the production of genetically improved planting stock for the production of industrial wood continued in 1965. This program is authorized under title IV of the Agricultural Act of 1956. The 35 States in this program planted and seeded about 100,000 acres on State-owned forests. Cooperation in this program affords 13 States an opportunity to establish forest tree seed orchards that will make valuable contributions to their long-range plans for reforestation with genetically improved stock.

COOPERATIVE FOREST FIRE CONTROL

Fire Protection Study Completed

A study completed in 1965 shows that 519 million acres of State and privately owned forest and nonforested watershed land is planned for fire protection within the next 5 years under section 2 of the Clarke-McNary Act at an estimated annual cost of $123 million. About 450 million acres of this area was receiving organized protection on June 30, 1965, leaving 69 million acres unprotected.

Planning is underway to provide organized protection to all unprotected rural lands within the next few years. Additional legislation and financing will be required to accomplish this goal in some instances.

Forest Fire Damage Up

Interim reports for the period January–June 1965 show that 61,771 fires burned 763,502 acres. This is an increase of 11.9 percent in the number of fires and 5.7 percent in acreage burned on the protected area over the same period in 1964. In the full year 1964, 90,480 fires burned 1,669,947 acres of protected State and private land.

Extreme fire danger prevailed throughout most of the Northeast during the summer and early fall

of 1965. Numerous fires occurred, the largest burning about 13,000 acres in Maine in August. An outbreak of fires occurred in drought-stricken northern California, burning about 200,000 acres in September.

Fire Prevention and Special Projects

In the field of fire prevention new emphasis has been placed on use of the most capable and experienced personnel to make detailed analyses of high incidence areas, establish priorities, and intensify prevention efforts tailored to meet specific problems.

A program of specialized assistance to State forestry organizations in administrative management analysis and long-range comprehensive planning was initiated in several States.

Revised Damage Appraisal System

Development of a revised Fire Damage Appraisal System is progressing according to schedule. Joint committees of Forest Service and State personnel have prepared operational instructions which relate the job more closely to forest survey data collection and simplify collection and computation of data. The system is being field tested in five Southeastern States prior to decision on its adoption for general use.

COOPERATIVE FOREST FIRE PREVENTION

At the opening of the 25th Cooperative Forest Fire Prevention Campaign in April, Secretary Freeman cited the Smokey Bear program as the Nation's longest organized effort to protect the beauty of America's outdoors. Despite the best efforts of Smokey and his helpers, forest fires did slightly more damage in 1965 than in the preceding year, though less than in 1963. Unusually severe hazards in the Northeast and in northern California accounted for a large number of fires.

Smokey at the World's Fair and Elsewhere

A full-size Smokey Bear figure was added to an industrial exhibit at the New York World's Fair in 1965 and was seen by more than 3 million visitors. The Smokey Bear exhibit, "Champion Forest Fire Preventer" in the Boy Scout area at the fair was moved to New Brunswick, N.J., where it will be a permanent museum attraction at Boy Scout National Headquarters.

"Smokey Bear and Friends," a 5-figure animated talking display, was presented at the National Association of Broadcasters Convention in Washington, D.C.; at the Florida State Fair in Tampa; and at two county fairs in Maryland before moving to Nashville where it was destroyed by a fire at the Tennessee State Fair grounds.

Free space for display of 10- by 4-foot Smokey Bear posters was accepted in March. Starting April 1, the large posters were shown for 2 to 6 months at 230 locations in shopping-center parking lots in 17 States. Much favorable comment was received on this first public service use of the space.

An art show of original Smokey Bear paintings was a popular feature at the 350th anniversary celebration at Taos, N. Mex.

Awards

The Golden Smokey statuette, highest forest fire prevention award, was given to Russell Z. Eller, volunteer coordinator of the Smokey Bear program since 1942, and to the National Council of State Garden Clubs. Smokey Bear plaques, for outstanding service in a region or State, were awarded to Erne Linford, columnist for the Salt Lake Tribune; Sessions S. Wheeler, teacher of biology and conservation education of Reno, Nev.; the Mississippi Forestry Association for effective contributions to help reduce incendiary woods burning; and the Idaho Junior Chamber of Commerce for conducting an outstanding forest fire prevention program in the State.

Smokey Bear appreciation certificates for service on the CFFP Executive Committee over the past 20 years were prepared and presented to 30 State officials. Lassie and his television master, Ranger Corey Stuart, presented to Smokey the Lassie Gold Award in ceremonies at the National Zoological Park in May.

More Items Produced

Printed matter production reached a new high in 1965. More than 26 million items were printed for the nationwide fire prevention campaign. Including materials produced for a special program in the South, the total reached more than 30 million pieces of literature. This volume was possible because of heavy purchases by field units. The Canadian Forestry Association purchased $4,400 worth of printed items for distribution in Canada.

Commercial Support

Thirty-nine licenses for use of the Smokey Bear symbol are currently in effect. New ones include an item of jewelry, aluminum coaster/ashtrays, a "Sing with Smokey" song book, a cigarette lighter with built-in snuffer, and a feature-length animated motion picture. Receipts from royalties and fees for these uses of the Smokey Bear symbol were approximately $31,000 for fiscal year 1965.

Administrative Support Functions

Accomplishments in National Forest management, forestry research, and State and private forestry are built on a solid foundation of administrative support operations. Personnel management helps to provide the recruiting, training, and career development necessary to maintain a force of highly qualified men and women. Budget and fiscal operations insure that every program makes the most of every dollar. Administrative management handles business operations and concentrates on efficiency and economy Service-wide. Careful planning for new or special programs permits progress without confusion or delay. Publications, procurement, communications, legislative liaison—these and many other functions are part of the essential support job in the day-to-day work of the Forest Service team.

JOB CORPS ADMINISTRATION

The Job Corps program on the National Forests went into full operation during 1965. Forty-five Job Corps Conservation Centers on National Forests in 29 States were activated, providing work and education opportunities for more than 7,000 corpsmen. Construction was largely completed for the two remaining centers that have been approved.

Work and Training

Corpsmen carried out work programs in natural resource conservation and forest development that have long been needed on the National Forests. The work included campground construction and rehabilitation, timber stand improvement, range improvements, road and trail construction and maintenance, and improvements to the Job Corps Centers. In several regions corpsmen contributed effectively to the control and suppression of forest fires.

But the Job Corps seeks more than resource conservation; it seeks human conservation—the development of young unemployed men into responsible workers capable of getting and holding jobs with a good future. This objective is reached by means of a program of basic education and occupational training, which is integrated with work experience on conservation and development projects. Criteria have been developed to help Job Corps administrators determine when a corpsman's occupational training, basic education, and social development have prepared him for job placement or advancement to other training.

Job Placement

Preliminary plans were developed during the year to operate a national job placement program for graduates of the Job Corps. In addition to this, the Forest Service made personalized efforts to place corpsman graduates in jobs with businesses and industries in areas near Forest Service operations.

ADMINISTRATIVE MANAGEMENT

The Forest Service continually seeks more efficient methods in every aspect of its work. Management officers review the many employee suggestions for work improvement; in addition, they conduct special studies in areas where the potential for greater economy and efficiency is indicated. During 1965 Service-wide studies were made and their findings implemented.

Cost Reduction

The President's program for Government-wide cost reduction added impetus to the already well-established Forest Service program. In this connection, management officers sought to identify and measure more effectively the ouputs of goods and services and the costs of those outputs in certain program areas. For fiscal year 1965 the Forest Service set goals of 5 percent increased productivity in eight specific program areas. The results of this effort are now being analyzed.

As part of this measurement program, the Forest Service published and distributed a booklet, "Increased Productivity and Reduced Costs in the Forest Service." The emphasis on economy and efficiency will continue and increase as all managers refine and apply productivity measurement techniques.

Further economy and efficiency was accomplished by means of a position management system, which was designed and implemented during the year.

New Quarters Rental Policy

Under a new Government quarters rental policy, the Budget Bureau has authorized the Forest Service to use the Consumer Price Index in adjusting base rental rates for Forest Service housing. This is simpler than the previous system whereby periodic appraisals of comparable individual

private rentals were the basis for rental charges on Forest Service quarters. Following a 3-year field test by the Forest Service, the Budget Bureau will evaluate the technique for possible application by other agencies.

Workload Studies

The Forest Service brought up to date the inventory of all range improvements on Forest Service lands and developed a new base for equitable allotment of range improvement maintenance funds. The Service also remeasured the workload base used for financing the care and policing of all recreation areas.

ADMINISTRATIVE SERVICES

The Forest Service achieved considerable savings in procurement and other administrative services during 1965. It acquired excess equipment, tools, and materiel from other Government agencies valued at $25,963,867, of which equipment valued at $13,322,604 was made available to the States through the Cooperative Forest Fire Control program. In addition, the Forest Service obtained savings through the use of excess real property, which helped to accelerate the building program. Excess lands also permitted a more aggressive land exchange program for the consolidation of federally owned land within National Forest boundaries.

Coordinated use of electrostatic and diazo process copying machines brought about a direct saving of $30,000 in copywork for program divisions. These machines have also doubled the output of copywork with no increase in the number of machine operators.

A programed instruction course was developed and tested to train Forest Service officers in service and supply contracting. It included instruction on bid preparation, receipt and opening, analysis, and award procedures. The text provides 3 hours of instruction, with pre- and post-test examinations to determine individual accomplishments; pre-test grades averaged 63 percent and post-test grades 96 percent.

This basic training can now be accomplished in 3 days instead of the 6 days previously required; moreover, it can be given wherever and whenever local needs require it. The saving in travel costs and time of instructors and trainees is estimated at about $27,000 annually.

PERSONNEL MANAGEMENT

During 1965 the Forest Service stressed an Equal Employment Opportunity program to increase the employment of persons from minority groups in both regular and seasonal jobs. Recruitment activities at colleges with predominantly Negro enrollment showed encouraging results in attracting qualified applicants to Forest Service and Job Corps employment. The program also included development of a central resource file to aid Regions and Stations in locating qualified applicants, projects to make more successful placements in remote areas, and efforts to interest more employees in administrative positions through the Federal Service Entrance Examination. Minority groups had good representation among the 800 youths employed by the Forest Service under the President's Youth Opportunity Corps program.

The Civil Service Commission approved a revised form of the Position Classification Standard for the Forest Service, GS–460; this will require the review of more than 5,000 Forest Service positions.

Training

The Forest Service continued to stress training and education to improve the capabilities and performance of its personnel. Twenty-nine career employees successfully completed academic training at graduate schools in various fields of specialization, including plant ecology, economics, tropical silviculture, organic chemistry, hydrology, genetics, public administration, and mathematics.

Programed texts were completed and put into use for training in subjects such as timber sales, Forest Service orientation, and multiple use planning. The use of these texts showed savings over conventional training methods that are expected to exceed $200,000 in the first year.

On-the-job training and supervision were further strengthened with the completion of a 20-minute film, "Coaching on the Job," which was distributed throughout the Service. It will be used together with the award-winning Forest Service training film, "Potential Unlimited."

Safety

The Forest Service met its 1965 goal in accident prevention by reducing injuries 25 percent below the previous 3-year average. Motor vehicle accidents were held to less than five per million miles of driving. This reduction in injuries and accidents avoided expenses estimated at $248,000. Steps were also taken to improve accident reporting. The Supervisor's Report of Accident, Form AD-278, was redesigned and given Departmental approval for experimental use. The changed form reduces time requirements by 10,000 manhours per year, and increases the accuracy of the information reported.

PROGRAMS AND LEGISLATION

Legislation

Four laws of major significance to the Forest Service were enacted during the first session of the 89th Congress: The Appalachian Regional Development Act (P.L. 89–4), the Federal Water Project Recreation Act (P.L. 89–72), the Water Resources Planning Act (P.L. 89–80), and an act to establish the Spruce Knob-Seneca Rocks National Recreation Area (P.L. 89–207).

The Appalachian Regional Development Act includes authority for the Secretary of Agriculture to provide technical and financial assistance in the organization and operation, under State law, of Timber Development Organizations in the Appalachian Region. The objectives of these private, nonprofit corporations will be to improve timber productivity and quality, and to increase returns to landowners.

The Federal Water Project Recreation Act declares a congressional policy that full consideration be given to outdoor recreation and fish and wildlife opportunities in the investigation, planning, and operation of Federal water resource projects. The act includes authority for the Secretary of the Interior to transfer jurisdiction over project lands and facilities within or adjacent to the exterior boundaries of National Forests to the Secretary of Agriculture for recreation and other National Forest System purposes.

The Water Resources Planning Act establishes a Water Resources Council to study, appraise, and coordinate Federal water resources policies and programs. The act also provides for the establishment of river basin commissions and for financial assistance to States for water resources planning.

Public Law 89–207 establishes the Spruce Knob-Seneca Rocks National Recreation Area in West Virginia. This National Recreation Area is within a few hours' drive for over 6 million people. The approximately 100,000-acre area is being administered as a part of the Monongahela National Forest. This is the first National Recreation Area established by Congress in which the Federal lands involved are all National Forest lands.

Other laws enacted in the first session of the 89th Congress which affect the Forest Service include: establishment of the Nez Perce National Historical Park (P.L. 89–19), Pacific Northwest Disaster Relief Act of 1965 (P.L. 89–41), an act to facilitate the work of the Department of Agriculture (P.L. 89–106), the Public Works and Economic Development Act of 1965 (P.L. 89–136), Economic Opportunity Act amendments of 1965 (P.L. 89–253), Water Quality Act of 1965 (P.L. 89–234), Food and Agriculture Act of 1965 (P.L. 89–321), and establishment of Whiskeytown-Shasta-Trinity National Recreation Area (P.L. 89–336).

During the same session the Forest Service followed on a day-to-day basis some 650 bills which would affect its activities. It prepared 96 legislative reports on bills and legislative proposals, assisted in the preparation and presentation of 21 statements before congressional committees; and reviewed and commented on 76 reports prepared by other Federal agencies. Legislative drafting services were provided as requested on 10 proposed bills.

Programs and Special Projects

The Forest Service made several studies for special projects and programs in close coordination with other Government agencies. The projects reflect the growing demands on Government agencies for more intensive management in the use of the Nation's natural resources.

During the year the Forest Service developed a proposed comprehensive 10-year Program for State and Private Forestry involving 15 major forestry measures. The objective is the more intensive management of all resources on 395 million acres of non-Federal commercial forest lands. Nine Department of Agriculture agencies participated in this effort. The program is now being reviewed by the office of the Secretary of Agriculture.

The Forest Service and the Soil Conservation Service participated in an interdepartmental task force on the Potomac River Basin. The task force's objective is to develop a comprehensive plan to make the basin a model of conservation. Fifty-six percent of the basin is in forest land and the remainder primarily agricultural; thus, the two agencies have a major interest in management plans that are developed.

The Forest Service was represented on a steering committee established to study a proposed nationwide system of trails. Forest Service Regions studied and reported on several major trunk trails, including the Pacific Crest and Continental Divide Trails and plans for specific area trails in the National Forests and Grasslands that will enlarge their recreation potential. Using these reports and other data, the committee has developed guidelines, completed fieldwork, and prepared a report for the President.

A planning-programing-budgeting system is being instituted in the Executive Branch. The system requires the Departments and Agencies to define a set of output-oriented program categories that cover the total work of the unit, to prepare 5-year programs and financial plans, and to analyze alternative programs or levels of programs to meet specific objectives. A small staff has been set up and will work closely with Forest Service Divisions, the Department's staff, and the Bureau of the Budget in implementing the new system.

A second Departmental Soil and Water Conservation Needs Inventory was begun with Forest Service participation. A special subcommittee on forest lands began preparation of revised forest land inventory procedures as part of this program. Inventory progress also included completion of preliminary field testing of land use sampling procedures, classification techniques, and basic inventory accounting concepts.

The Forest Service continued to assist in the Appalachian program as it entered a new phase in the transition from planning to field operations. A draft set of reference guidelines for field use was completed. Basic consultations between USDA agencies were held to insure Department-wide agreement on detailed administration of the complex program.

Other special projects supported by the Forest Service included the Northern Great Lakes Task Force, rural poverty program, the National Hunting and Fishing Survey, coordination of natural beauty efforts, water pollution control programs, and an interim revision of the Departmental Land and Water policy guide.

CIVIL DEFENSE

The Forest Service has specific responsibilities as one of the agencies participating in the Nation's civil defense effort. Duties assigned to it by the Secretary of Agriculture under Executive Order 10998 include the development of an effective national rural fire defense plan, the performance of certain research projects in cooperation with military services and the Office of Civil Defense, radiological monitoring, and other activities to promote civil preparedness in event of a national emergency or major disaster.

Fire Coordination Study

During 1965 the Forest Service completed portions of a National Fire Coordination Study, begun the preceding year under contract for the Office of Civil Defense, Department of the Army. This project has three objectives: (1) Define the potential nuclear fire problem, (2) recommend a nationwide fire defense program for the Office of Civil Defense, and (3) recommend how the fire defense program might be implemented.

Phase I of the study, covering objectives one and two, was completed by the spring of 1965. It entailed the review of pertinent fire research, study of large fires, and analysis of a wide range of factors relating to nuclear attack, fire control, and national defense.

The summary report stated that fire would cause a significant loss of life and resources in event of a nuclear attack. It presented alternative fire defense programs that can be interrelated, combined, or expanded to meet national objectives. The Office of Civil Defense approved the recommended fire program on a minimum basis, and means for implementing the program are being developed under phase II of the study.

Rural Fire Defense

A major concern in developing an effective rural fire defense program is the lack of organized protection, except for local volunteer units, on 500 million acres of pasture, grasslands, cropland, and intermingled woodlands. The Forest Service and cooperating States worked to expand the organized protection area within the limits of current legislation and financing. The National Rural Fire Defense Committee and State Committees continued their coordination, planning, and training activities.

A pilot training program in rural civil defense fire suppression was continued in five States with funds furnished by the Office of Civil Defense. This program, which is administered through the respective State Foresters, was well received at the local community level and considerably increased fire suppression capability. About 3,200 volunteers in more than 200 local groups participated in the training, donating nearly 20,000 man-hours to the effort.

Defense-Sponsored Research

Fire research personnel continued to provide advisory services to the Department of Defense and the Office of Emergency Planning. Progress was also made on the three fire research projects sponsored by the Office of Civil Defense; these were a study of critical fire weather patterns, a project dealing with measurements of the environment in and around mass fires, and detection and mapping of forest fires by means of airborne infrared scanning devices.

The Forest Service improved its radiological monitoring capability throughout the year. As of December 31, 1965, the total number of employees trained as monitors was 3,130, including 162 licensed instructors. A total of 878 monitoring stations are now established throughout the National Forest System.

BUDGET AND FINANCE

Receipts and Expenditures

Receipts from the sale or use of National Forest resources amounted to $147,410,834 in fiscal year 1965. These receipts came from the following major sources.

Timber	$138,768,926
Grazing	3,039,909
Other	5,601,999
Total	147,410,834

This includes $5,210,925 received from National Forest revested Oregon and California Railroad grant lands. In addition, resource revenue amounting to $1,828,606 was received from National Grasslands and land utilization areas administered under title III of the Farm Tenant Act.

Other amounts received, not listed above, included $1,697,894 contributed by cooperators and timber purchasers for cooperative work on National Forest programs, $20,725,817 set aside for timber sale area improvements, $9,551,371 set aside for brush disposal, $1,485,661 from miscellaneous receipts, and $10,964 for restoration of forest lands and improvements.

Direct receipts and deposits from all sources totaled $182,711,148. In addition, timber purchasers built roads valued at $56,684,322 incident to timber harvest. Other Federal agencies collected $18,114,194 for power licenses, mineral leases, and permits on National Forest land of public domain origin.

Operating expenses for National Forest programs, National Grasslands, and land utilization

projects amounted to $202,966,642. Depreciation of roads, trails, and other improvements was estimated at $50,308,834.

Receipts and all other earnings exceeded operating expenditures and other charges by $4,234,187.

Expenditures for other Forest Service activities included $24,331,038 for cooperative State and private forestry programs, and $31,025,230 for forestry research. Cooperator contributions to these programs were $2,229,501 for cooperative forestry programs and $831,225 for research. The Forest Service also received $31,016 in royalties from the Smokey Bear forest fire prevention program.

Under the act of May 23, 1908, as amended, the Forest Service pays 25 percent of National Forest net receipts to States for support of schools and roads in counties containing National Forest lands. This payment in fiscal year 1965, based on fiscal year 1964 receipts, was $32,837,416. Arizona and New Mexico school funds also received $108,205 under provisions of the act of June 20, 1910. Under the act of June 22, 1948, Minnesota received $137,763. Counties containing National Grasslands and land utilization areas received $448,910 for schools and roads from calendar year 1964 receipts under the act of July 22, 1937.

By law the Forest Service retains 10 percent of receipts from National Forest resources for development of National Forest roads and trails, except on revested Oregon and California Railroad grant lands. The amount available in this fund from fiscal year 1965 receipts was $14,203,671.

A revised method of accounting for timber sale receipts was installed throughout the Forest Service. The revised procedures will result in better service to our timber sale customers.

Statistical Tables

NOTE: Other statistical tables will be published later in a statistical supplement.

TABLE 1.—*National Forest and other lands administered by the Forest Service, as of June 30, 1965*

State, Commonwealth, or possession	National Forest [1]	National Grassland	Land utilization projects	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	631, 544	0	0	631, 544
Alaska	20, 741, 961	0	0	20, 741, 961
Arizona	11, 417, 850	0	0	11, 417, 850
Arkansas	2, 426, 089	0	0	2, 426, 089
California	19, 931, 271	0	19, 115	19, 950, 386
Colorado	13, 729, 989	611, 970	560	14, 342, 519
Connecticut	10	0	0	10
Florida	1, 075, 075	0	0	1, 075, 075
Georgia	780, 078	0	9, 340	789, 418
Idaho	20, 298, 353	47, 599	0	20, 345, 952
Illinois	211, 822	0	0	211, 822
Indiana	125, 209	0	3, 180	128, 389
Iowa	0	0	360	360
Kansas	0	107, 270	0	107, 270
Kentucky	461, 747	0	0	461, 747
Louisiana	591, 571	0	0	591, 571
Maine	49, 551	0	465	50, 016
Massachusetts	1, 651	0	0	1, 651
Michigan	2, 581, 957	0	6, 703	2, 588, 660
Minnesota	2, 774, 673	0	0	2, 774, 673
Mississippi	1, 134, 123	0	0	1, 134, 123
Missouri	1, 362, 055	0	12, 938	1, 374, 993
Montana	16, 637, 250	0	0	16, 637, 250
Nebraska	245, 414	94, 307	0	339, 721
Nevada	5, 059, 834	0	0	5, 059, 834
New Hampshire	678, 476	0	0	678, 476
New Mexico	8, 864, 755	133, 904	89, 426	9, 088, 085
New York	0	0	13, 768	13, 768
North Carolina	1, 125, 197	0	0	1, 125, 197
North Dakota	520	1, 104, 438	0	1, 104, 958
Ohio	112, 509	0	0	112, 509
Oklahoma	229, 847	46, 607	0	276, 454
Oregon	15, 362, 595	102, 980	0	15, 465, 575
Pennsylvania	472, 453	0	0	472, 453
South Carolina	587, 343	0	0	587, 343
South Dakota	1, 121, 385	863, 741	2, 885	1, 988, 011
Tennessee	599, 625	0	1, 212	600, 837
Texas	658, 026	117, 269	0	775, 295
Utah	7, 962, 965	0	0	7, 962, 965
Vermont	232, 479	0	0	232, 479
Virginia	1, 458, 376	0	0	1, 458, 376
Washington	9, 690, 016	0	520	9, 690, 536
West Virginia	906, 420	0	0	906, 420
Wisconsin	1, 469, 279	0	430	1, 469, 709
Wyoming	8, 570, 625	573, 167	0	9, 143, 792
Puerto Rico	27, 889	0	27	27, 916
Virgin Islands	147	0	0	147
Total	182, 400, 004	3, 803, 252	160, 929	186, 364, 185

[1] This column includes lands administered by the Forest Service, except National Grasslands and land utilization project lands which are shown separately.

TABLE 2.—*Volume and value of timber cut from National Forests, timber stand improvements, and area planted and seeded to trees, fiscal year 1965*

State and Commonwealth	Timber cut		Timber stand improvement,[1] fiscal year 1965	Area planted and seeded to trees	
	Volume	Value		Fiscal year 1965	Total planted and seeded through June 30, 1965
	Thousand board feet	*Dollars*	*Acres*	*Acres*	*Acres*
Alabama	64, 132	1, 402, 690	9, 642	5, 768	86, 011
Alaska	430, 707	883, 190	95	105	4, 872
Arizona	309, 444	1, 761, 681	16, 723	2, 363	8, 576
Arkansas	156, 021	4, 054, 577	48, 023	3, 470	63, 718
California	1, 770, 201	21, 832, 433	20, 704	18, 580	199, 789
Colorado	176, 027	694, 261	7, 742	10, 168	98, 157
Florida	76, 507	1, 090, 733	1, 443	5, 933	67, 993
Georgia	46, 368	1, 148, 846	12, 148	2, 932	52, 474
Idaho	820, 150	5, 711, 224	8, 062	21, 131	179, 524
Illinois	8, 140	74, 764	1, 718	1, 922	50, 904
Indiana	4, 877	47, 013	2, 030	1, 025	27, 827
Iowa	0	0	0	0	60
Kentucky	28, 633	405, 878	8, 505	903	3, 668
Louisiana	72, 050	1, 153, 697	24, 592	3, 041	162, 168
Maine	10, 453	67, 147	1, 175	0	67
Michigan	146, 497	870, 532	13, 366	12, 621	644, 434
Minnesota	132, 755	703, 086	6, 468	9, 564	196, 092
Mississippi	138, 236	2, 473, 097	48, 249	9, 372	237, 041
Missouri	45, 009	471, 564	27, 092	8, 611	103, 128
Montana	726, 186	6, 287, 996	7, 659	13, 731	86, 274
Nebraska	15	94	341	1, 207	32, 452
Nevada	237	935	65	114	620
New Hampshire	21, 935	265, 456	11, 497	0	1, 181
New Mexico	92, 858	429, 288	4, 025	3, 115	9, 218
New York[2]	10	94	52	0	42
North Carolina	53, 131	956, 736	10, 190	5, 106	38, 843
North Dakota[3]	54	530	0	0	967
Ohio	4, 986	44, 571	1, 670	617	21, 440
Oklahoma	6, 741	131, 488	6, 458	2, 383	12, 896
Oregon	3, 540, 216	75, 547, 958	35, 110	41, 188	440, 294
Pennsylvania	26, 461	956, 113	11, 825	118	19, 748
Puerto Rico	9	188	0	0	0
South Carolina	90, 531	1, 942, 780	7, 198	3, 634	31, 854
South Dakota	43, 116	328, 369	3, 350	1, 563	43, 522
Tennessee	35, 658	474, 586	6, 805	1, 352	12, 328
Texas	105, 440	2, 258, 691	1, 519	1, 615	59, 746
Utah	54, 378	260, 752	6, 626	3, 668	11, 333
Vermont	14, 853	387, 219	6, 853	0	1, 430
Virginia	59, 569	396, 979	12, 774	1, 424	9, 361
Washington	1, 691, 281	24, 049, 423	8, 923	25, 055	283, 800
West Virginia	40, 591	561, 766	20, 150	378	19, 389
Wisconsin	82, 888	569, 623	8, 429	6, 325	253, 904
Wyoming	116, 674	407, 654	4, 351	2, 640	14, 029
Total	11, 244, 025	161, 105, 702	433, 647	232, 742	3, 591, 174

[1] Includes release, weeding, thinning, and pruning only.
[2] Land utilization projects.
[3] National Grasslands.

TABLE 3.—*Estimated legal harvest of principal big-game animals*[1] *in National Forests and National Grasslands, fiscal year 1965*

State	Deer	Elk	Bear	Moose	Turkey[2]
Alabama	980				680
Alaska	11, 000	60	680	760	
Arizona	16, 000	1, 200	190		2, 000
Arkansas	2, 600				170
California	37, 000		630		
Colorado	71, 000	15, 000	700		700
Florida	1, 600		50		360
Georgia	2, 400				180
Idaho	47, 000	12, 000	1, 700	110	
Illinois	2, 800				
Indiana	600				
Kentucky	180				15
Louisiana	1, 400				
Maine	130		4		
Michigan	30, 000		230		95
Minnesota	15, 000		350		
Mississippi	3, 000		1		670
Missouri	6, 000				350
Montana	46, 000	10, 000	1, 500	620	240
Nebraska	610				210
Nevada	12, 000	7	2		
New Hampshire	570		40	1	
New Mexico	17, 000	910	200		1, 200
North Carolina	4, 000		140		25
North Dakota	3, 000				
Ohio	60				
Oklahoma	110				
Oregon	67, 000	13, 000	940		
Pennsylvania	4, 500		60		1, 500
South Carolina	1, 300				130
South Dakota	7, 400	15			500
Tennessee	1, 300		35		70
Texas	1, 200				
Utah	82, 000	1, 100	50	20	110
Vermont	940		60		
Virginia	9, 200		190		2, 100
Washington	26, 000	5, 300	1, 500		
West Virginia	1, 800		65		500
Wisconsin	7, 700		180		
Wyoming	30, 000	9, 800	330	700	1, 500

[1] Figures rounded in posting.
[2] Turkey classed as a big-game species for this report.

TABLE 4.—*Construction, reconstruction, and maintenance of National Forest (forest development) roads, bridges, and trails, fiscal year 1965*

State and Commonwealth	Roads				Bridges: construction	Trails		Total obligations [1] from all U.S. funds
	Government construction and reconstruction	Construction and reconstruction: by timber purchasers		Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Dollars* [2]	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	3. 2	0. 0	0	799. 4	0	0. 0	0. 0	386, 825
Alaska	8. 2	18. 1	895, 000	240. 9	3	7. 0	511. 1	2, 251, 533
Arizona	65. 1	46. 0	579, 331	10, 539. 4	1	51. 7	3, 572. 9	3, 096, 817
Arkansas	7. 2	12. 3	78, 300	2, 638. 2	1	0	0	889, 986
California	85. 7	788. 5	11, 404, 360	34, 479. 6	5	39. 2	14, 834. 8	20, 149, 841
Colorado	251. 8	40. 9	291, 800	13, 817. 4	10	168. 0	9, 483. 2	5, 404, 537
Florida	28. 8	9. 7	24, 476	1, 124. 2	1	0	0	431, 832
Georgia	3. 6	0	0	1, 175. 7	0	0	182. 6	520, 585
Idaho	201. 6	517. 6	3, 379, 320	16, 598. 0	24	66. 5	19, 305. 0	11, 239, 681
Illinois	5. 6	0	0	398. 1	0	0	31. 3	216, 530
Indiana	1. 3	0	0	1, 104. 3	0	0	0	97, 927
Kansas	0	0	0	88. 6	0	0	0	1, 775
Kentucky	8. 9	2. 6	9, 012	777. 2	0	0	114. 9	301, 119
Louisiana	3. 0	0	9, 090	1, 031. 8	17	0	0	367, 924
Maine	0. 8	0. 9	9, 677	57. 1	0	0. 3	85. 8	16, 122
Michigan	63. 4	5. 0	10, 490	4, 872. 8	1	4. 0	44. 1	1, 310, 340
Minnesota	40. 4	0	0	3, 409. 4	0	0	473. 3	1, 714, 468
Mississippi	1. 6	29. 4	111, 235	911. 6	9	0	5. 0	507, 541
Missouri	18. 3	0	0	1, 874. 2	1	0	24. 0	423, 832
Montana	84. 0	419. 2	2, 243, 365	13, 842. 8	28	62. 3	15, 022. 4	11, 914, 988
Nebraska	42. 7	0	0	334. 6	0	0. 3	1. 0	392, 539
Nevada	10. 9	0	0	3, 258. 8	0	10. 6	1, 878. 1	545, 968
New Hampshire	4. 8	0	0	274. 1	5	1. 6	1, 056. 8	563, 956
New Mexico	30. 6	10. 8	29, 737	8, 689. 3	0	15. 3	3, 772. 6	2, 909, 798
New York	0	0	0	110. 9	0	0	0	0
North Carolina	7. 2	4. 9	33, 000	1, 150. 0	0	14. 0	1, 218. 6	699, 862
North Dakota	0	0	0	1, 398. 7	0	0	0	7, 111
Ohio	0. 5	0	0	307. 3	0	0	0	85, 789
Oklahoma	3. 5	0	0	238. 6	0	0	0	92, 070
Oregon	239. 3	1, 597. 3	26, 670, 050	26, 784. 8	23	121. 7	8, 520. 4	21, 420, 799
Pennsylvania	1. 6	59. 2	314, 712	811. 3	0	0	158. 6	533, 117
Puerto Rico	1. 8	0	0	2. 0	1	0	38. 9	202, 486
South Carolina	2. 6	48. 5	156, 885	1, 017. 9	3	9. 1	2. 8	327, 589
South Dakota	43. 1	8. 0	44, 047	2, 394. 6	2	0	10. 3	545, 302
Tennessee	18. 2	0	0	813. 5	1	0	500. 8	530, 134
Texas	5. 6	0	26, 335	864. 8	2	0	0	294, 631
Utah	93. 9	45. 8	73, 203	6, 516. 2	5	24. 9	6, 510. 4	2, 742, 780
Vermont	1. 5	1. 8	41, 600	472. 2	1	0	193. 5	241, 459
Virginia	14. 3	4. 5	16, 400	1, 395. 2	1	0	1, 101. 3	659, 421
Washington	79. 2	652. 9	10, 121, 450	10, 606. 3	20	51. 0	8, 010. 4	8, 289, 295
West Virginia	0	20. 3	10, 600	1, 560. 0	0	0	744. 6	516, 494
Wisconsin	28. 9	2. 1	1, 292	2, 962. 4	1	7. 7	0	987, 331
Wyoming	100. 9	16. 0	99, 555	6, 389. 1	9	15. 7	5, 537. 7	2, 675, 154
Dist. of Columbia [3]	0	0	0	0	0	0	0	1, 318, 994
Total	1, 613. 6	4, 362. 3	56, 684, 322	188, 133. 3	175	670. 9	102, 947. 2	107, 826, 282

[1] Total obligations are for construction, reconstruction, maintenance, and flood repair. Does not include timber purchaser construction and reconstruction.

[2] Represents Government-appraised value of roads constructed by timber purchasers under provisions of timber sale contracts.

[3] Administrative expenses.

TABLE 5.—*Recreation sites and capacities in the National Forests and National Grasslands as of June 30, 1965*

Type of facility	Number of sites, classed according to number of annual visits						Area	Normal capacity (persons at one time)	Number of family units			
	Under 1,000	1,000 to 5,000	5,000 to 15,000	15,000 to 25,000	Over 25,000	Total			Tent camping	Trailer camping	Picnicking	Total
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Number*	*Number*	*Number*	*Number*	*Number*
Campground	3, 021	1, 652	733	167	105	5, 678	33, 758	326, 884	47, 557	7, 656	6, 461	61, 674
Picnic site	416	575	341	101	118	1, 551	7, 286	98, 411	745	102	17, 964	18, 811
Subtotal	3, 437	2, 227	1, 074	268	223	7, 229	41, 044	425, 295	48, 302	7, 758	24, 425	80, 485
Organization camp owned by Forest Service	34	34	5	0	0	73	894	7, 664	------	------	------	------
Organization camp in private ownership	220	225	53	2	0	500	6, 964	65, 917	------	------	------	------
Hotel, lodge, or resort owned by Forest Service	4	2	4	2	5	17	325	3, 203	------	------	------	------
Hotel, lodge, or resort in private ownership	113	134	89	21	32	389	2, 730	49, 824	------	------	------	------
Other public service	81	55	31	10	25	202	1, 056	18, 468	------	------	------	------
Recreation residence	1, 926	259	67	8	5	2, 265	17, 639	105, 494	------	------	------	[1] 18, 974
Swimming site	33	75	75	30	24	237	530	40, 209	------	------	------	------
Boating site	204	229	115	14	9	571	1, 029	45, 494	------	------	------	------
Winter sports site	33	45	43	16	62	199	45, 987	269, 082	------	------	------	------
Observation site	89	81	60	22	61	313	776	23, 196	------	------	------	------
Total	6, 174	3, 366	1, 616	393	446	11, 995	118, 974	1, 054, 026	48, 302	7, 758	24, 425	80, 485

[1] Number of residences.

TABLE 6.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1965 (under Clarke-McNary Program)*

State and Commonwealth	Expenditures derived from—				Trees distributed
	Federal allotment	State appropriation	Receipts	All sources	
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Number*
Alabama	3,000	16,667	151,756	171,423	29,330,000
Arkansas	4,000	12,913	72,500	89,413	15,303,000
California	3,000	80,005	32,381	115,386	2,319,000
Colorado	8,995	8,995	40,172	58,162	489,000
Connecticut	4,000	15,266	32,548	51,814	1,265,000
Delaware	3,000	17,816	----------	20,816	1,124,000
Florida	3,000	72,780	242,998	318,778	58,702,000
Georgia	3,000	40,095	183,262	226,357	38,487,000
Hawaii	3,000	95,395	----------	98,395	880,000
Idaho	12,000	18,676	12,747	43,423	534,000
Illinois	3,000	39,177	73,071	115,248	4,767,000
Indiana	3,000	91,048	95,090	189,138	2,875,000
Iowa	----------	----------	42,243	42,243	1,021,000
Kansas	12,000	22,995	31,685	66,680	1,116,000
Kentucky	3,000	166,372	91,306	260,678	9,845,000
Louisiana	3,000	72,811	102,273	178,084	20,834,000
Maine	4,000	42,557	55,340	101,897	2,513,000
Maryland	3,000	47,415	5,255	55,670	5,436,000
Massachusetts	3,000	38,323	9,689	51,012	492,000
Michigan	3,000	119,103	58,463	180,566	6,916,000
Minnesota	4,000	260,632	183,867	448,499	28,404,000
Mississippi	3,000	118,225	197,458	318,683	43,870,000
Missouri	3,000	96,862	55,046	154,908	5,467,000
Montana	14,770	33,679	44,247	92,696	1,114,000
Nebraska	----------	----------	96,305	96,305	2,224,000
Nevada	8,000	9,885	8,338	26,223	90,000
New Hampshire	3,000	23,509	15,303	41,812	1,043,000
New Jersey	4,000	20,453	10,741	35,194	822,000
New Mexico	6,000	7,869	4,995	18,864	134,000
New York	3,000	302,009	110,470	415,479	15,711,000
North Carolina	3,000	38,164	202,806	243,970	28,130,000
North Dakota	12,000	44,753	29,936	86,689	1,011,000
Ohio	3,000	143,016	116,835	262,851	12,077,000
Oklahoma	12,000	27,628	6,701	46,329	913,000
Oregon	6,000	27,365	102,854	136,219	7,491,000
Pennsylvania	3,000	174,693	68,987	246,680	12,115,000
Puerto Rico	2,000	28,630	----------	30,630	1,266,000
Rhode Island	1,932	8,327	5,392	15,651	----------
South Carolina	3,000	56,032	209,685	268,717	40,824,000
South Dakota	12,000	25,196	40,394	77,590	1,071,000
Tennessee	3,000	49,787	72,725	125,512	17,365,000
Texas	3,000	10,039	36,630	49,669	4,932,000
Utah	3,166	12,491	9,572	25,229	192,000
Vermont	4,000	8,696	24,735	37,431	1,800,000
Virginia	3,000	106,322	144,941	254,263	40,859,000
Washington	----------	14,509	180,400	194,909	6,944,000
West Virginia	4,000	116,747	96,760	217,507	6,937,000
Wisconsin	3,000	82,085	363,858	448,943	21,441,000
Wyoming	2,557	2,557	7,261	12,375	156,000
Total	250,420	2,868,569	3,787,812	6,865,010	508,651,000

TABLE 7.—*Planting stock available for forest and windbarrier planting on State and private lands, area planted or seeded, and acreage in need of planting*

State and Commonwealth	Planting stock shipped, fiscal year 1965			Area planted or seeded, fiscal year 1965 [1]	Plantable area as of Jan. 1, 1953 [2]	Planting needs, 1958 [3]
	State nurseries	Other	Total			
	Thousands	*Thousands*	*Thousands*	*Acres*	*Acres*	*Acres*
Albama	35, 028	14, 911	49, 939	63, 932	1, 675, 000	5, 006, 000
Alaska	0	0	0	0	----------	----------
Arizona	0	0	0	236	18, 000	40, 000
Arkansas	14, 803	0	14, 803	19, 371	1, 408, 000	1, 405, 000
California	2, 794	19, 355	22, 149	12, 472	3, 357, 000	3, 001, 000
Colorado	537	3, 949	4, 486	4, 068	295, 000	318, 000
Connecticut	1, 678	125	1, 803	1, 482	205, 000	111, 000
Delaware	849	0	849	1, 199	34, 000	11, 000
Florida	58, 702	27, 170	85, 872	128, 339	4, 859, 000	7, 033, 000
Georgia	42, 140	48, 847	90, 987	101, 043	1, 566, 000	6, 344, 000
Hawaii	880	29	909	2, 009	----------	810, 000
Idaho	517	14, 425	14, 942	900	265, 000	691, 000
Illinois	7, 005	0	7, 005	4, 939	2, 856, 000	904, 000
Indiana	3, 846	9, 083	12, 929	5, 232	1, 290, 000	330, 000
Iowa	1, 616	250	1, 866	1, 487	613, 000	264, 000
Kansas	0	442	442	2, 390	915, 000	230, 000
Kentucky	11, 534	1, 875	13, 409	16, 411	1, 500, 000	2, 004, 000
Louisiana	21, 656	4, 650	26, 306	46, 774	1, 139, 000	2, 379, 000
Maine	2, 888	1, 000	3, 888	2, 639	472, 000	1, 171, 000
Maryland	5, 516	4, 000	9, 516	6, 778	250, 000	455, 000
Massachusetts	543	495	1, 038	944	114, 000	254, 000
Michigan	6, 916	37, 879	44, 795	31, 589	2, 905, 000	1, 424, 000
Minnesota	28, 404	6, 086	34, 490	31, 263	2, 410, 000	5, 427, 000
Mississippi	38, 570	18, 801	57, 371	67, 086	4, 187, 000	2, 255, 000
Missouri	9, 556	0	9, 556	7, 697	1, 267, 000	3, 200, 000
Montana	1, 439	3, 512	4, 951	3, 554	214, 000	931, 000
Nebraska	0	6, 048	6, 048	6, 267	968, 000	87, 000
Nevada	81	0	81	146	28, 000	30, 000
New Hampshire	1, 777	0	1, 777	1, 100	309, 000	464, 000
New Jersey	847	300	1, 147	1, 127	93, 000	819, 000
New Mexico	0	0	0	307	97, 000	245, 000
New York	15, 292	2, 124	17, 416	15, 720	1, 250, 000	1, 378, 000
North Carolina	31, 803	12, 000	43, 803	40, 699	898, 000	2, 841, 000
North Dakota	1, 174	6, 000	7, 174	10, 113	742, 000	231, 000
Ohio	13, 952	0	13, 952	17, 931	729, 000	616, 000
Oklahoma	2, 021	0	2, 021	1, 296	876, 000	1, 054, 000
Oregon	14, 635	10, 942	25, 577	47, 418	969, 000	2, 008, 000
Pennsylvania	15, 293	23, 000	38, 293	40, 021	1, 080, 000	869, 000
Puerto Rico	1, 322	0	1, 322	1, 588	----------	105, 000
Rhode Island	0	0	0	390	39, 000	85, 000
South Carolina	49, 010	5, 001	54, 011	61, 387	1, 169, 000	2, 269, 000
South Dakota	436	1, 800	2, 236	8, 054	702, 000	129, 000
Tennessee	18, 014	13, 867	31, 881	18, 006	1, 465, 000	1, 181, 000
Texas	5, 453	3, 872	9, 325	16, 672	539, 000	2, 235, 000
Utah	229	0	229	326	37, 000	46, 000
Vermont	2, 440	0	2, 440	1, 996	99, 000	274, 000
Virginia	42, 250	10, 445	52, 695	72, 121	1, 799, 000	880, 000
Washington	13, 333	19, 896	33, 229	68, 629	751, 000	1, 136, 000
West Virginia	7, 154	0	7, 154	7, 269	989, 000	567, 000
Wisconsin	21, 411	6, 041	27, 452	27, 188	2, 685, 000	5, 172, 000
Wyoming	0	0	0	443	95, 000	103, 000
Total	555, 344	338, 220	893, 564	1, 029, 048	52, 222, 000	70, 822, 000

[1] Includes 143,710 acres directly seeded, primarily in Georgia, Florida, Louisiana, Oregon, and Washington. By estimate, 80 percent of these plantings and seedings are successful.

[2] Figures are those reported in "Timber Resources for America's Future." Alaska, Hawaii, and Puerto Rico were not included in the timber resource study.

[3] As reported in the National Inventory of Soil and Water Conservation Needs, 1962.

TABLE 8.—*Cooperative forest management accomplishments and expenditures, fiscal year 1965*

(U.S. Forest Service and State Foresters cooperating)

State	Accomplishments				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*M bd. ft.*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	747	99, 980	9, 093	199, 657	46, 744	46, 744	93, 488
Alaska	3	410	0	0	23, 026	23, 026	46, 052
Arkansas	1, 026	101, 858	2, 051	26, 888	44, 500	58, 053	102, 553
California	2, 102	277, 813	48, 630	1, 194, 433	46, 322	87, 957	134, 279
Colorado	370	181, 619	6, 153	25, 416	36, 350	46, 843	83, 193
Connecticut	1, 749	57, 027	1, 898	75, 328	30, 900	31, 909	62, 809
Delaware	93	1, 551	967	37, 300	4, 847	4, 847	9, 694
Florida	3, 893	2, 057, 209	32, 508	856, 978	115, 700	274, 183	389, 883
Georgia	3, 659	394, 752	34, 816	745, 843	113, 100	172, 670	285, 770
Hawaii	50	89, 835	0	0	11, 290	11, 290	22, 580
Idaho	870	42, 043	678	49, 278	18, 800	18, 853	37, 653
Illinois	1, 861	33, 997	6, 219	346, 247	63, 400	92, 612	156, 012
Indiana	1, 749	60, 491	3, 992	167, 775	51, 800	60, 758	112, 558
Iowa	1, 408	17, 048	1, 827	116, 825	36, 100	38, 900	75, 000
Kansas	633	13, 153	405	45, 579	41, 000	45, 820	86, 820
Kentucky	3, 023	63, 418	8, 166	279, 135	93, 560	223, 717	317, 277
Louisiana	341	62, 694	2, 253	23, 752	41, 500	50, 597	92, 097
Maine	1, 388	76, 694	28, 949	408, 638	71, 700	100, 928	172, 628
Maryland	1, 550	26, 477	6, 154	197, 976	52, 100	88, 637	140, 737
Massachusetts	2, 887	49, 229	37, 020	457, 504	33, 500	45, 648	79, 148
Michigan	1, 992	49, 338	7, 081	220, 218	87, 000	128, 923	215, 923
Minnesota	2, 708	29, 595	2, 684	160, 366	50, 300	60, 826	111, 126
Mississippi	2, 793	229, 404	4, 100	85, 744	58, 400	116, 996	175, 396
Missouri	2, 896	217, 196	28, 392	658, 482	88, 400	167, 738	256, 138
Montana	298	23, 133	1, 849	57, 007	19, 030	19, 030	38, 060
Nebraska	717	5, 916	1, 209	46, 408	20, 544	20, 544	41, 088
Nevada	125	305	0	0	15, 961	15, 962	31, 923
New Hampshire	3, 003	122, 750	9, 883	720, 601	38, 750	53, 357	92, 107
New Jersey	800	32, 295	3, 217	78, 050	33, 800	38, 233	72, 033
New Mexico	81	27, 382	6, 871	60, 500	26, 200	32, 717	58, 917
New York	7, 190	235, 818	27, 505	859, 625	147, 800	156, 766	304, 566
North Carolina	7, 526	113, 031	50, 830	1, 174, 221	122, 600	281, 445	404, 045
North Dakota	186	7, 006	1, 986	15, 203	30, 253	30, 253	60, 506
Ohio	2, 890	61, 510	9, 671	883, 194	83, 500	103, 301	186, 801
Oklahoma	246	15, 746	16	890	13, 705	13, 705	27, 410
Oregon	1, 240	41, 315	2, 813	153, 648	24, 700	26, 267	50, 967
Pennsylvania	3, 250	91, 086	12, 614	305, 349	101, 900	158, 432	260, 332
Rhode Island	369	11, 169	1, 599	7, 780	8, 900	9, 079	17, 979
South Carolina	3, 466	241, 442	15, 807	469, 089	77, 900	126, 397	204, 297
South Dakota	378	34, 960	2, 591	20, 604	28, 174	28, 174	56, 348
Tennessee	1, 808	153, 684	12, 965	346, 935	62, 000	84, 936	146, 936
Texas	441	43, 529	2, 050	205, 407	41, 000	56, 987	97, 987
Utah	110	37, 443	0	0	12, 100	14, 585	26, 685
Vermont	2, 923	66, 811	10, 328	321, 973	61, 500	99, 274	160, 774
Virginia	6, 700	270, 705	222, 272	3, 970, 571	159, 800	248, 558	408, 358
Washington	2, 018	74, 583	17, 475	648, 983	60, 800	62, 375	123, 175
West Virginia	3, 171	70, 853	3, 194	69, 017	61, 900	114, 842	176, 742
Wisconsin	7, 700	148, 290	26, 152	644, 960	187, 200	285, 474	472, 674
Wyoming	2	0	0	0	6, 718	6, 718	13, 436
Total, U.S.	96, 429	6, 163, 593	716, 933	17, 439, 377	2, 707, 074	4, 085, 886	6, 792, 960
Puerto Rico	2, 645	1, 405	17	3, 051	23, 232	23, 232	46, 464
Grand total	99, 074	6, 164, 998	716, 950	17, 442, 428	2, 730, 306	4, 109, 118	6, 839, 424

TABLE 9.—*Pest control accomplishment and costs, calendar year 1965*

OAK WILT CONTROL

Land ownership or management	Area surveyed	Trees treated	Funds expended		
			Federal	State	Total
National Forest:	*Acres*	*Number*	*Dollars*	*Dollars*	*Dollars*
George Washington	896, 000	80	2, 589		2, 589
Jefferson	134, 000	3	220		220
Monongahela	800, 000	29	924		924
Subtotal	1, 830, 000	112	3, 733		3, 733
State and private:					
Arkansas	8, 000, 000	0	1, 919	3, 898	5, 817
Pennsylvania	7, 672, 000	3, 669	12, 129	36, 387	48, 516
Virginia	3, 625, 000	217	1, 549	4, 747	6, 296
West Virginia	26, 775, 000	4, 135	26, 674	100, 533	127, 207
Subtotal	46, 072, 000	8, 021	42, 271	145, 565	187, 836
Grand total	47, 902, 000	8, 133	46, 004	145, 565	191, 569

BLISTER RUST CONTROL

Land ownership or management	Control by ribes eradication						Control with antibiotics		
	Premaintenance work		Maintenance work		Ribes eradicated	Control established	Area surveyed [2]	Area treated	Trees treated
	Surveyed [1]	Treated	Surveyed [1]	Treated					
	Acres	*Acres*	*Acres*	*Acres*	*Number*	*Acres*	*Acres*	*Acres*	*Number*
Federal:									
USDA, Forest Service	90, 307	22, 778	91, 553	7, 344	2, 623, 000	12, 041	436, 094	74, 557	7, 573, 807
Department of the Interior:									
National Parks	105, 617	12, 399	15, 418	2, 469	838, 000	14, 333	0	1, 880	71, 400
Bureau of Land Management	6, 135	945	3, 271	72	200, 000	1, 213	0	66	4, 175
Indian Reservations	2, 916	323	13, 917	2, 205	116, 000	323	0	0	0
Subtotal, USDI	114, 668	13, 667	32, 606	4, 746	1, 154, 000	15, 869	0	1, 946	75, 575
Total, Federal	204, 975	36, 445	124, 159	12, 090	3, 777, 000	27, 910	436, 094	76, 503	7, 649, 382
Non-Federal	361, 067	98, 343	1, 582, 435	40, 930	5, 652, 000	66, 027	199, 699	19, 250	2, 358, 100
Grand total	566, 042	134, 788	1, 706, 594	53, 020	9, 429, 000	93, 927	635, 793	95, 753	10, 007, 482

[1] Systematically inspected to locate area in need of treatment and to determine effectiveness of control.
[2] Inspected to determine where antibiotic treatment is feasible and where cost-benefit ratios are favorable.

TABLE 9.—*Pest control accomplishment and costs, calendar year 1965*—Continued

INSECT CONTROL

Land ownership or management	Bark beetles		Defoliators		Other insects			Costs for all insects [4]
	Trees treated [3]	Control costs	Area treated	Control costs	Area treated	Trees treated	Control costs	
	Number	*Dollars*	*Acres*	*Dollars*	*Acres*	*Number*	*Dollars*	*Dollars*
National Forest	939, 291	2, 556, 748	815, 189	728, 666	1, 422	4, 720	69, 773	[5] 3, 355, 187
State and private	149, 628	201, 665	241, 320	149, 834	133	160, 267	17, 424	368, 923
Total	1, 088, 919	2, 758, 413	1, 056, 509	878, 500	1, 555	164, 987	87, 197	3, 724, 110

[3] Includes infested trees, stumps, and cull logs.
[4] Exclusive of administrative and survey expenditures.
[5] Includes the Federal share of costs on non-Federal lands.

TABLE 10.—*Forest Service receipts and expenditures, all programs and sources, fiscal year 1965*

Item	Receipts	Expenditures
	Dollars	*Dollars*
National Forest programs:		
Cash receipts and appropriation expenditures	182, 711, 147	302, 046, 658
Cash receipts from National Forest land collected by and deposited to accounts of other agencies (Federal Power Commission, Department of Interior)	18, 114, 194	
Noncash income and expense (roads built by timber purchasers)	56, 684, 322	56, 684, 322
Total	257, 509, 663	358, 730, 980
Forest research programs:		
Forest research appropriations		30, 179, 038
Cooperative research work	831, 225	846, 192
Total	831, 225	31, 025, 230
State and private forestry programs:		
Fire protection, tree distribution, and forest management cooperation		16, 942, 294
Assistance to States for tree planting		998, 058
Great Plains conservation program		20, 105
Insect and disease control		1, 834, 802
Flood prevention and watershed protection		2, 202, 892
Forest fire prevention, "Smokey Bear"	31, 016	30, 292
Cooperator funds	2, 229, 501	2, 302, 595
Total	2, 260, 517	24, 331, 038
Work for other Government agencies and non-Government persons and firms:		
Economic Opportunity Program		30, 754, 458
Insect and disease control (Interior Department lands)		48, 975
Miscellaneous work for other Government agencies	3, 397, 278	5, 589, 544
Work performed for non-Government persons, firms, etc.—cooperative work	2, 588, 231	2, 255, 629
Reimbursed	857, 491	857, 491
Total	6, 843, 000	39, 506, 097
Total receipts and expenditures	267, 444, 405	453, 593, 345
Cash receipts distributed to States, counties, and Puerto Rico as directed by Congress (receipts of fiscal year 1964 except as indicated):		
Payments to States and Puerto Rico (act 5–23–08), National Forest fund		[1] 32, 837, 416
Payments to school funds, Arizona and New Mexico (act 6–20–10), National Forest fund		108, 205
Payment to Minnesota (Cook, Lake, and St. Louis Counties) (Superior National Forest) (act 6–22–48), National Forest fund		137, 763
Payment to counties—National Grasslands and land utilization areas (act 7–22–37) (receipts of calendar year 1964)		448, 910
Total		33, 532, 294
Internal equipment and supply services (working capital fund):		
Financed primarily by charges included above to Forest Service programs	25, 831, 518	24, 449, 499

[1] Does not include approximately $3,116,025 due counties from fiscal year 1964 receipts on National Forest O&C lands. This amount was included in total receipts of $4,154,700 transferred to Interior for distribution under act of Aug. 28, 1937 (50 Stat. 874), as amended.

NOTE: Expenditures are on an obligation basis except Working Capital Fund, which is on an accrual basis.

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